

The Only Journal With a Paid Circulation in the Rock Products Industry

Rock Products

Vol. XXIV, No. 9

CHICAGO

April 23, 1921

EDITORIAL DEPARTMENT—

Nathan C. Rockwood, Editor
Chas. A. Breskin, Assistant Editor
L. R. Croy, Assistant Editor

ADVERTISING STAFF—

Charles H. Fuller, Eastern Manager,
101 West 41st Street, New York City

G. J. Nelson
A. S. Barnett
Western Representatives

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ROCK PRODUCTS—

Geo. P. Miller, Manager
E. M. Gibson, Assistant Manager

Published every other Saturday by

TRADEPRESS PUBLISHING CORP.
542 South Dearborn Street, Chicago, Ill.

W. D. Callender, President.
N. C. Rockwood, Vice-President.
Geo. P. Miller, Treasurer.
C. O. Nelson, Secretary.

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Your Problems – Our Business.

If you have a problem in the designing of a plant in the Talc, Silica, Rock Phosphate, Pulverized Limestone, or kindred industries, a problem of conveying, a problem of handling materials in all its phases, our engineering staff is at your service.

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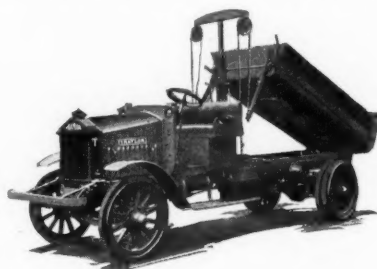
The Traylor "Bulldog" is always a producing force. It delivers the maximum utility at lowest cost.

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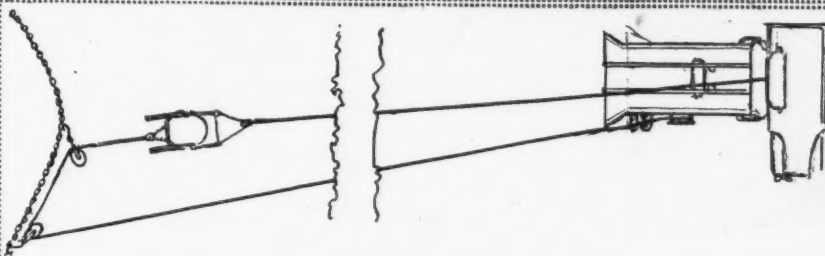
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The **RAPIDIGGER** is a new digging and loading machine that is light in weight, simple in construction, easily moved about, and will save the labor of from 10 to 15 men, depending upon the kind of material being dug.

It will dig and load practically any material, either from the natural bed or deposit, or from storage piles. Unsurpassed for stripping and for sand and gravel excavating and loading.

It has two speeds; the low speed is used to load the scraper and the high speed to drag it in and return it to the scraper operator quickly. Can be quickly moved about under its own power. Covers a wide area and operates on as long a distance as required.

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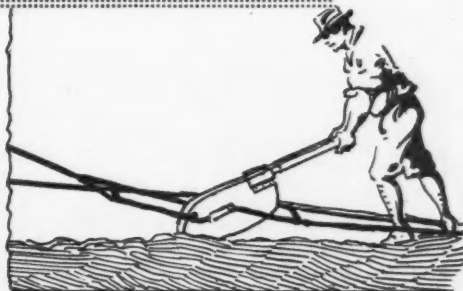
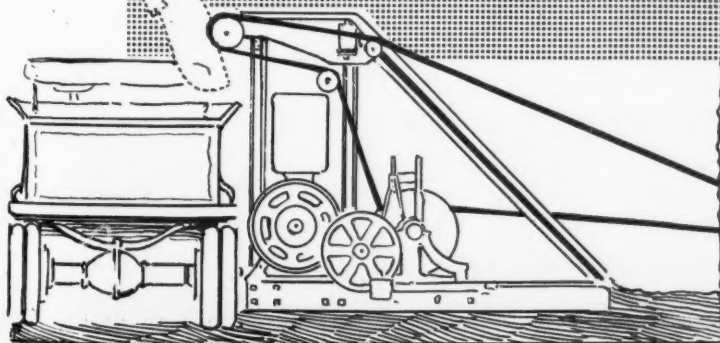
Write for our bulletin containing full description.

Our Engineer is at your service to assist you in the solution of your materials handling problems

THE RAPIDIGGER CO.

TRADE MARK

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HUM-MER *Electric* SCREEN



Bethlehem Steel Co.'s Report

"Before passing our coal through the wet washery, we have been screening it by the HUM-MER Process in order to eliminate a portion of the fines.

"Our installation consists of a pair of screens 3 ft. in width and 5 ft. long, a total of 30 sq. ft.

"We had estimated that these screens would have a capacity of about 25 tons an hour, but in many cases they have handled as much per hour as 110 tons of coal having as high as 10% moisture. This performance has never been equaled by any other screening process with which we are familiar.

"So far as we are able to ascertain, the HUM-MER Process involves a lower first cost and a smaller operating expense than any other screening process.

"The most distinctive feature of the HUM-MER Screens is their great capacity. It is this combination of great capacity with low cost which has made them practical for our work.

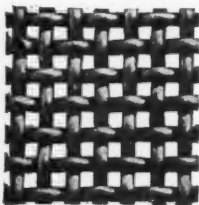
"The HUM-MER Screens are very convenient, the parts being readily accessible for quick repairs and cleaning.

"Both of these operations are easily accomplished without shutting down the entire plant.

"We have found the manufacturers very satisfactory people to deal with, and we appreciate their co-operation in helping us make our use of the HUM-MER Screens a success."

(Signed) FRANK A. ROBBINS, JR.,
General Manager

BETHLEHEM STEEL COMPANY



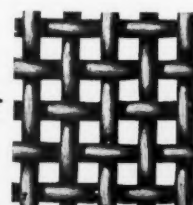
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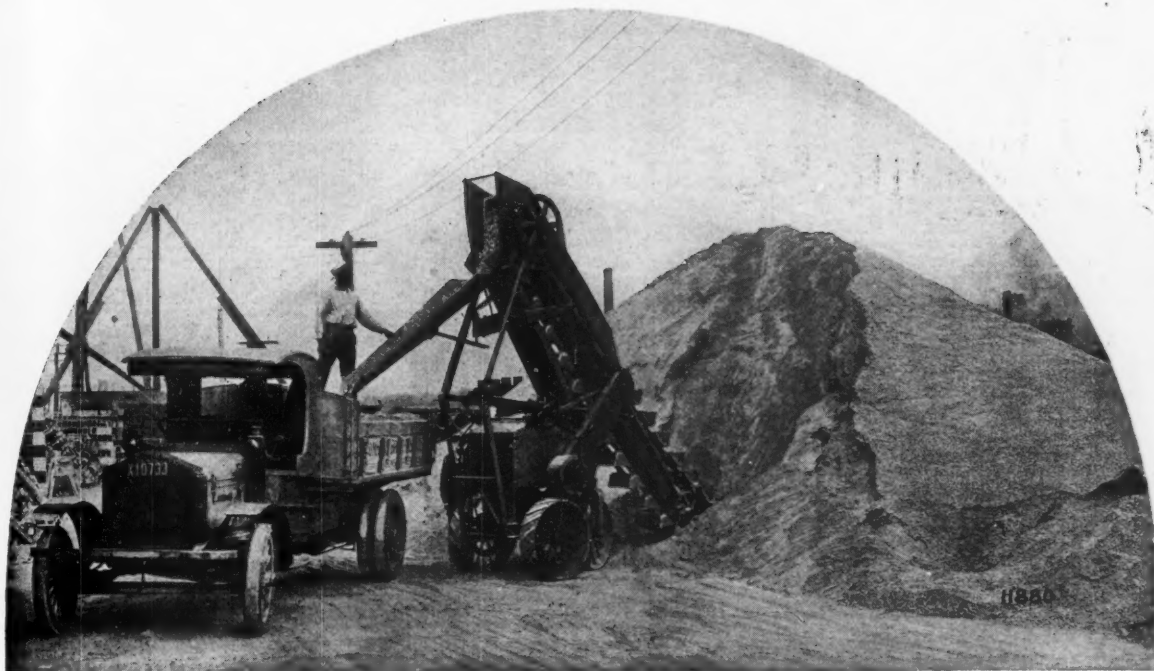
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Jeffrey Type "G" Radial Loader handling sand at the Tompkins Bros. Company, Newark, New Jersey

Look at That Jeffrey Radial Loader Make the Sand Fly

IT DIGS into the pile 8 to 10 feet, loading Sand, Gravel, Crushed Stone, Coal and other loose materials at the rate of 1 to 2 cubic yards per minute—and without the use of any mechanical devices to bring material to the buckets.

Wouldn't it pay you to find out more about the facts that make Jeffrey Radial Loaders real labor-aiding and money-saving equipment? Catalogs Nos. 288-N and 309-H fully illustrate and describe them.

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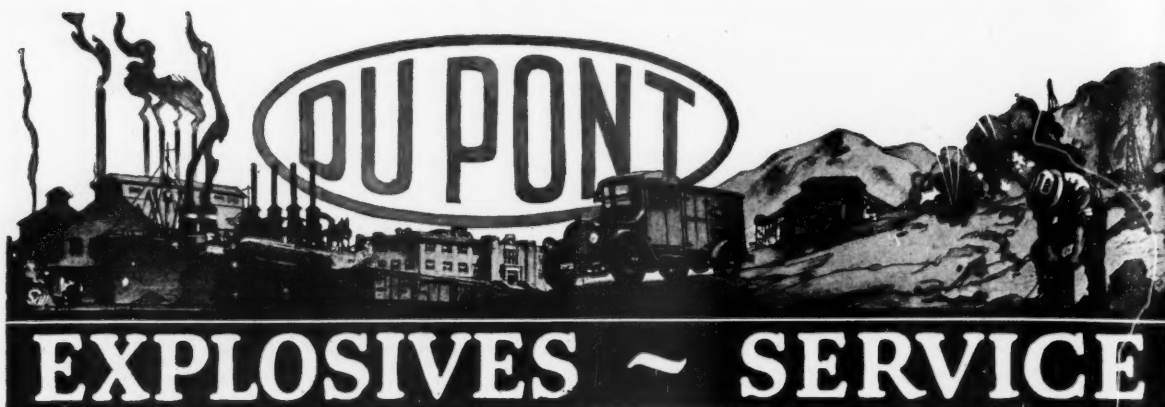
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By developing new types of explosives that are more efficient and more economical than those of yesterday, our staff of over 300 chemical engineers have made possible a very substantial saving to users of explosives.

The two most notable developments in the explosives industry since the introduction of dynamite in 1866—low-freezing ammonia and permissible powders—came from the Du Pont Laboratories, where constant efforts are still being made to bring them to a still higher state of perfection.

The introduction of these two powders is saving explosives users *one cent* a pound on approximately 100,000,000 pounds a year, for not only is their cost less on the basis of equal nitroglycerin content, but lower "strength" of these powders can be used to accomplish equal results. Besides contributing to economical use of explosives, these powders have reduced the hazards to life and property to a very large degree, resulting in the saving of a vastly greater sum.

Constant research and improvement is merely one phase of Du Pont Explosives Service. Vast facilities for production, supervision hitherto unknown in point of accuracy to insure uniform high quality, a great chain of distributing magazines, a fine force of *practical* explosives experts in the field combine to make a Service complete in every detail.

We suggest that you take advantage of Du Pont Explosives Service in *your* work—as so many thousands of others have done in their work.

E. I. du Pont de Nemours & Co., Inc.

Sales Department: Explosives Division

Wilmington, Delaware



When writing advertisers please mention ROCK PRODUCTS



THE KELLY ISLAND LIME AND TRANSPORT COMPANY, of Cleveland, operating quarries throughout Ohio and West Virginia, is one of the largest producers of limestone products in the country. "Marions" have been their approved choice for many years, twenty-three in all following the installation of their first shovel, a Model "G," in 1903.

The continued preference of this large organization for our products is typical of many others in the limestone industry. Owners and operators alike prefer "Marions" for they know that "Marion" *Quality and Service* can always be depended upon.

If you are needing a shovel for next season's work your order should be placed now to insure early spring delivery.

THE Marion
STEAM SHOVEL CO.

Established 1884

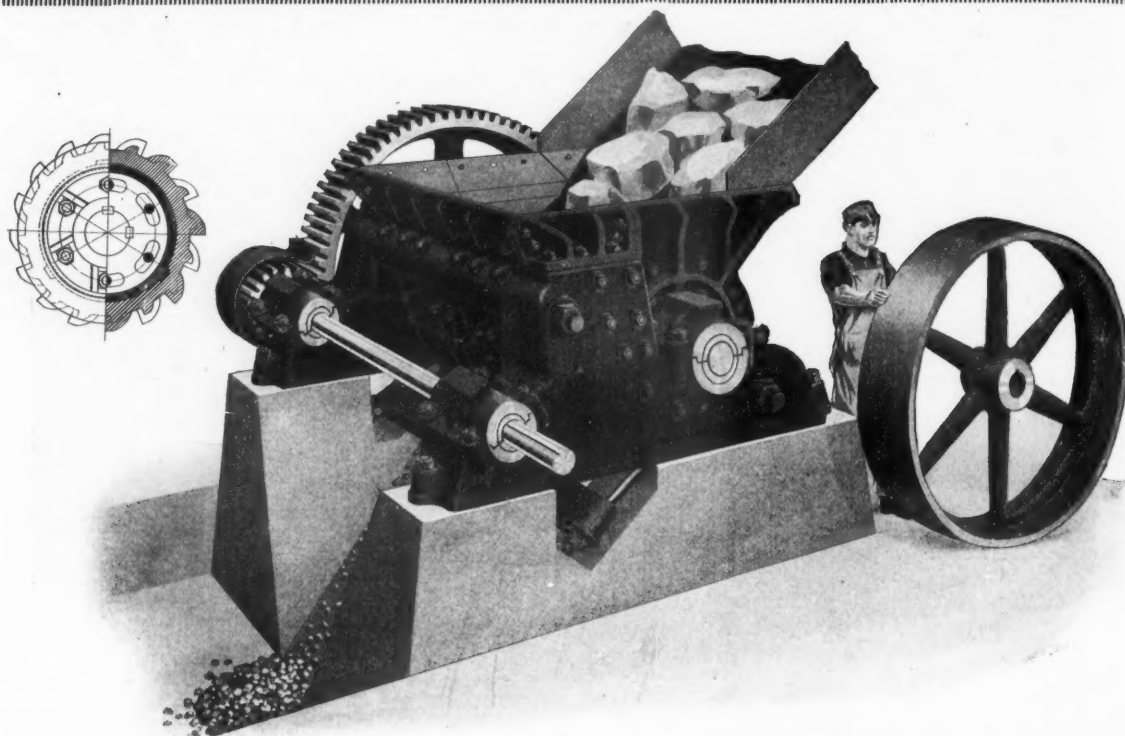
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Stevenson^{New} Type Crusher

This is a Single Roll Swinging Plate Crusher—our Model A-339—and while it is new in design, and an innovation in the crushing industry, it is old enough to have proven its efficiency, value and worth.

All wearing parts of this machine are made of the very hardest and toughest materials—manganese and other heat-treated steels. The teeth on the roll are transferable, thereby keeping up the efficiency and reducing the upkeep costs, and roll disks can be assembled to accommodate material being crushed, staggering the teeth or placing them all in a straight line. The breaking plate is provided with liners, half and quarter soles, of manganese or other heat-treated steels, and these can be changed on the breaking plate, thereby getting three different wearings from the same piece of metal. The bearings are big and strong, amply providing for any emergency. The gear teeth are short stub type of immense strength.

Stevenson Roll Crushers are self-feeding.

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So spoke the Superintendent of a Hydrated Lime Plant the other day when he called on us.

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Raymond Equipment is always built upon this basis of ultimate satisfaction to the user. No pains are spared to use the best materials obtainable and the best workmanship in putting them together.

That is why hundreds of satisfied users employ Raymond Equipment with Air Separation to produce their fine powdered materials and why 75 per cent of our business is repeat orders.

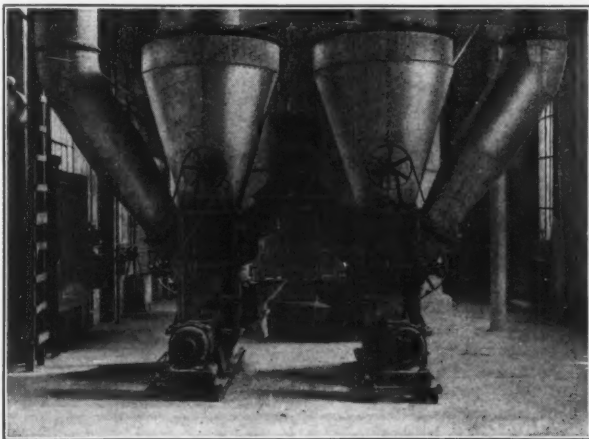
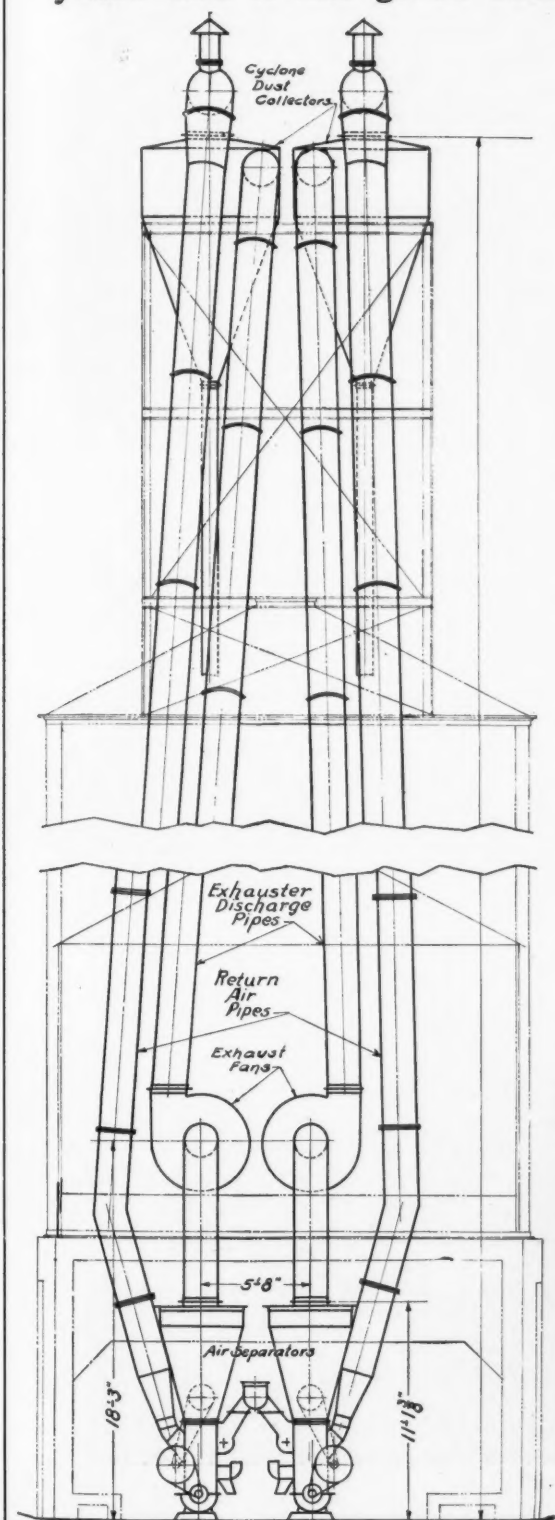
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Bucyrus shovels that are especially designed for quarry work, have a range in size from the 14-B 2/3-yd. machine to the 110-C. R. R. type with a 6-yd. dipper. Whether your pit is wet or dry, large or small, there is a Bucyrus dragline excavator to suit your requirements. The 30-B 1-yd. revolving shovel illustrated below can be readily converted into a clam shell excavator, a crane, a dragline excavator or a sewer shovel. There are few conditions under which it cannot be employed efficiently, and it may be converted from one type to the other in the field.

Its efficiency as a dragline excavator in the sand and gravel pit is beyond all question. There are no tracks to lay, no wear and tear on cars and locomotives, no pumping and no fear of delay due to flooded pits.

Bucyrus dragline excavators built in all sizes, with booms from 40 to 155 ft.

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No. 310

Bucyrus Company

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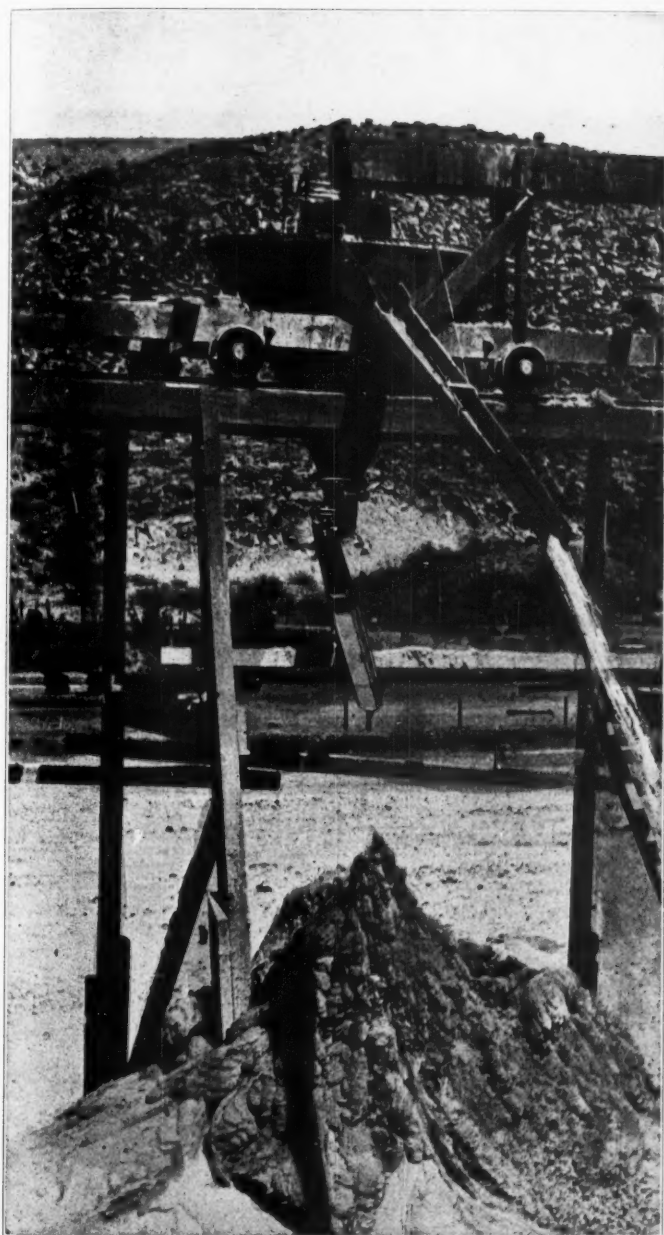
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San Francisco
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ALLEN CONES



Allen Sand Cone, Mounted on Truck, Building Stock Pile at
Globe, Arizona

Works in Any Place

Allen Sand Cones may be set anywhere that they can be reached by a sluiceway or pipe, as they require no power and practically no attention. They may be mounted on trucks to fill a bin or build a stock pile as illustrated.

Classification

The work of the Allen Sand Cone in classifying sand into sizes can only be excelled by certain laboratory devices. Roofing gravel very free from fines, carefully graded blast sand and "fillers" of various sorts may all be produced with a certainty that the mesh sizes will be within the proper limits.

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Thousands of tons of valuable fine sands are being lost every day in waste waters. Allen Cones will recover and wash these fine sands and deliver them as a free marketable product.

Service

Our engineering department will be glad to co-operate with you in considering any problem relating to the washing or classification of sand.

The ALLEN CONE COMPANY, *Engineers*
El Paso, Texas

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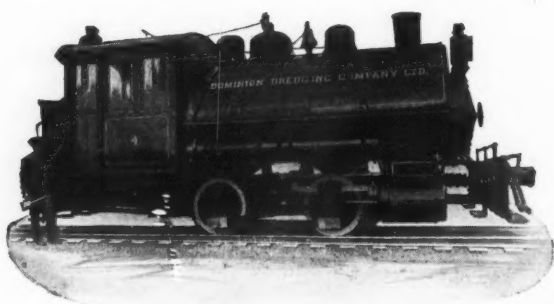


Vulcan Locomotives

CONTRACTORS have no trouble in coming out "on top" when Vulcan Locomotives are used.

Not only are you sure of avoiding loss due to haulage delays, but the reserve power and the design of Vulcan Locomotives enable you to improve on your estimated haulage time.

No matter in what class of work you specialize, there is a Vulcan Locomotive that will fit your requirements. Tell us what they are and let us submit details.



VULCAN IRON WORKS

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1753 Main Street

Wilkes-Barre, Pa.

Myers-Whaley Shoveling Machines Insure a Flexible Operation

SPECIFICATIONS

Weight—About 18,000 lbs., in working order.

Track Gauge—To suit your mine tracks.

Length—About 25 ft. over all.

Width—5 ft. 4½ in. over all.

Height—5 ft. 4 in. from rail, minimum.

Wheel Base—42 in.

Reach—10 ft. to each side from center of track.

Shovel—34 in. wide.

Motor—20-hp., 250 ft. of cable on reel.

Capacity—One ton per minute in rock.

Will handle 1000-lb. lumps.

Shipping Weight—About 22,000 lbs., boxed for export.

Full Crew—One operator, one car coupler, one helper.

In times of great activity production can be increased without materially increasing number of men. In slack times only a very small force has to be "cared for." When speeding up again it can be done without delay.

A recent illustration of this has just come to our attention. A plant had been closed for three months, and the quarry (an underground operation equipped with Myers-Whaley shovels) was shut down. It resumed operations a few weeks ago, using two Myers-Whaley No. 4 machines, which loaded from the first day they resumed operation an average of 650 TONS per shift, with a crew of 3 men on each machine. This we consider real shoveling at less cost than any other known method underground. This is only one instance of the efficiency and economy that can be obtained by the use of the MYERS-WHALEY in underground loading.

The partial list of users given in our treatise on "The Use of Shoveling Machines in Underground Work" shows the wide use of the Myers-Whaley in tunnels, mines and quarries.

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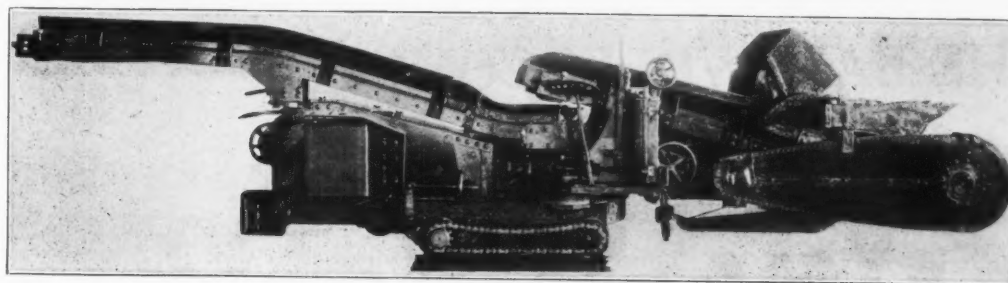
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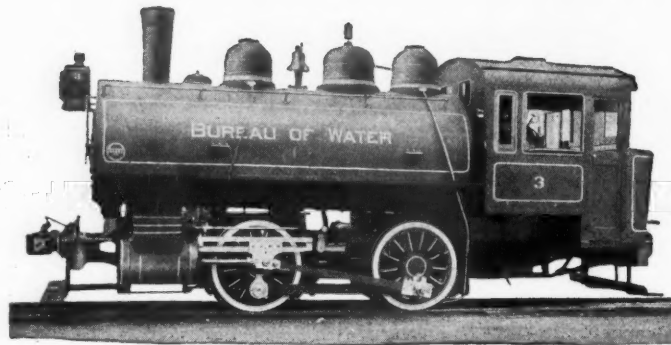


No. 4 Size Myers-Whaley Shoveling Machine

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BALDWIN

Gauge, 4' 8 1/2"
Cylinders, 17" x 24"
Boiler, diameter, 52"
Steam pressure, 180 lbs.
Fuel, soft coal
Grate area, 16 sq. ft.



Drivers, diameter, 50"
Wheel base, 7' 6"
Total weight, 100,000 lbs.
Tank capacity, 1200 gals.
Fuel capacity, 2200 lbs.
Tractive force, 21,200 lbs.

Four-Coupled Tank Locomotive Used for Switching and Hauling by the

Bureau of Water, City of Philadelphia

Many industrial plants and contractors are using Baldwin locomotives which have given years of the hardest service under the most trying conditions, and are still in good order.

There is a Baldwin design which will meet your requirements. Records Nos. 86, 94 and 95, describing Steam and Internal Combustion locomotives, forwarded upon request.

THE BALDWIN LOCOMOTIVE WORKS
PHILADELPHIA

LOCOMOTIVES

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WHAT THE TELSMITH REDUCTION CRUSHER DOES—

Effects a reduction of 7-to-1;

Takes unrestricted gravity feed;

Operates without supervision under 25 ft. head of rock;

Discharges by gravity without centrifugal action;

Wears uniformly without pitted or grooved crushing surfaces;

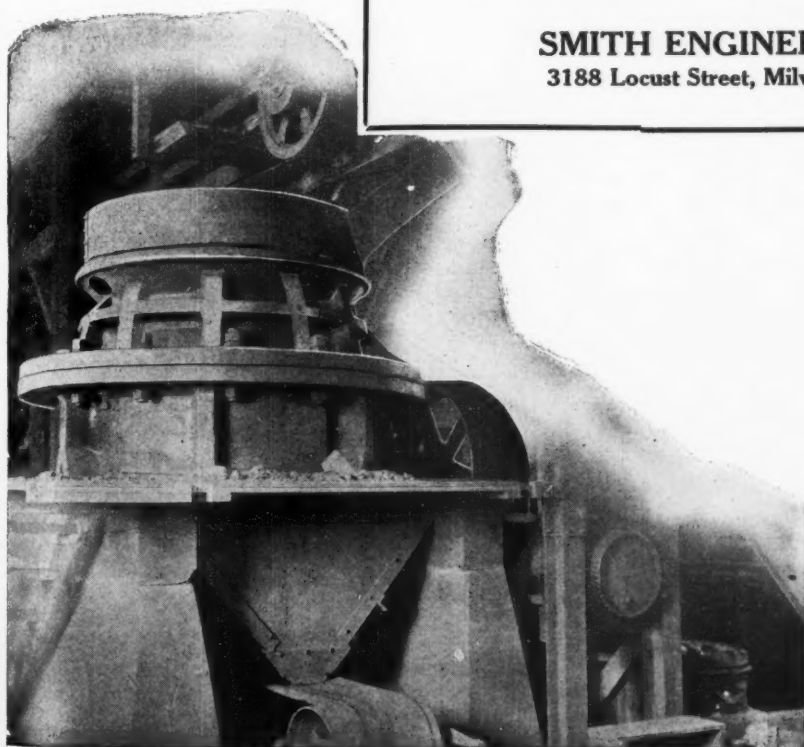
Develops very little fly-wheel effect;

Digests tramp iron with few breakages.

It is a short, massive pillar-shaft crusher with mushroom shaped head—the ideal re-crusher. Economical of floor space and head-room. Dust-proof and automatically oiled. Glad to send you Bulletin No. 4-F-11 (Telsmith Reduction Crushers) and Catalog No. 166 (Telsmith Primary Breakers). Just write for them.

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Philadelphia, Pa.
261 Franklin St.
Boston, Mass.
110 W. Park Way, N. S.
Pittsburgh, Pa.
6110 Euclid Ave.
Cleveland, O.
Brunson Bldg.
Columbus, O.
2540 University Ave.
St. Paul, Minn.
Chester, Fla.
506 So. Peters St.
New Orleans, La.
426 Flynn Bldg.
Des Moines, Ia.
Bowman Hdqrs. Co.,
Omaha, Neb.
Salt Lake Hardware Co.,
Salt Lake City, Utah
625 Market St.
San Francisco, Calif.
Road Bldgs. Eq. Co.,
Portland, Ore.

Canadian Representatives:
Canadian Ingersoll-Rand Co.,
Montreal, P. Q.

PLYMOUTH



Showing a 6-Ton Plymouth Locomotive as a Part of the Equipment of The McNichol Paving & Construction Co.

Plymouth Hauls Twenty-Car Train

The above illustration shows one of three 6-ton Plymouth Locomotives working on a 14-mile stretch of cement roadway, sixteen feet wide, at Greenwood, Delaware.

The Plymouth served by hauling twenty cars a distance of four miles, each car loaded with a one yard batch. In this haul it was necessary to negotiate a 3 per cent grade.

Mr. McNichol was highly elated with the service rendered by the Plymouth Locomotives, and expressed satisfaction for having bought his haulage units where the experimental stage had long ago been completed. Hence, real service, no repairs, no delays, slight up-keep expense, and profits commensurate. That's the kind of a haulage unit. Ask for Special Road Bulletin.

The Fate-Root-Heath Company Plymouth, Ohio

PLYMOUTH

Gasoline Locomotives

Rock Products

Vol. XXIV

Chicago, April 23, 1921

No. 9

Talc Mining and Preparation

Recently Completed Plant of the American Mineral Co. at Johnson, Vt., Typifies Modern Progress in the Industry

THE NEW TALC MILL of the American Mineral Co., at Johnson, Vt., has recently been completed and is now operating in conjunction with the old mill to triple the output of this plant.

This plant is undoubtedly one of the

*Based on information furnished by Raymond B. Ladoo, mineral technologist, U. S. Bureau of Mines, in his report "Talc Mining in Vermont, September, 1919."

most modern and up-to-date in the talc industry. It is also one of the largest producers of talc in this country.

Talc Deposit and Mine*

The American Mineral Co. operates a mill beside the tracks of the St. Johnsbury and Lake Champlain Railroad, near Johnson, Lamoille County, Vermont. The

main source of talc for this mill is a mine about four miles distant in the eastern part of the town. A small tonnage, however, is taken from a deposit now nearly exhausted, close to the mill, but this source is utilized only when weather conditions make difficult haulage by wagon from the main deposit. There is a possibility that this deposit may be success-



Fig. 1—Shaft to talc mine near Johnson, Vt., American Mineral Co.



Figs. 2-7—Mine views in one of the largest talc deposits in Vermont



Fig. 8—General view of front of new mill showing 6-ft. loading platform. The six storage bins in the form of silos, holding 300 tons each, are contained in this structure, with baggers beneath, just inside the doors shown

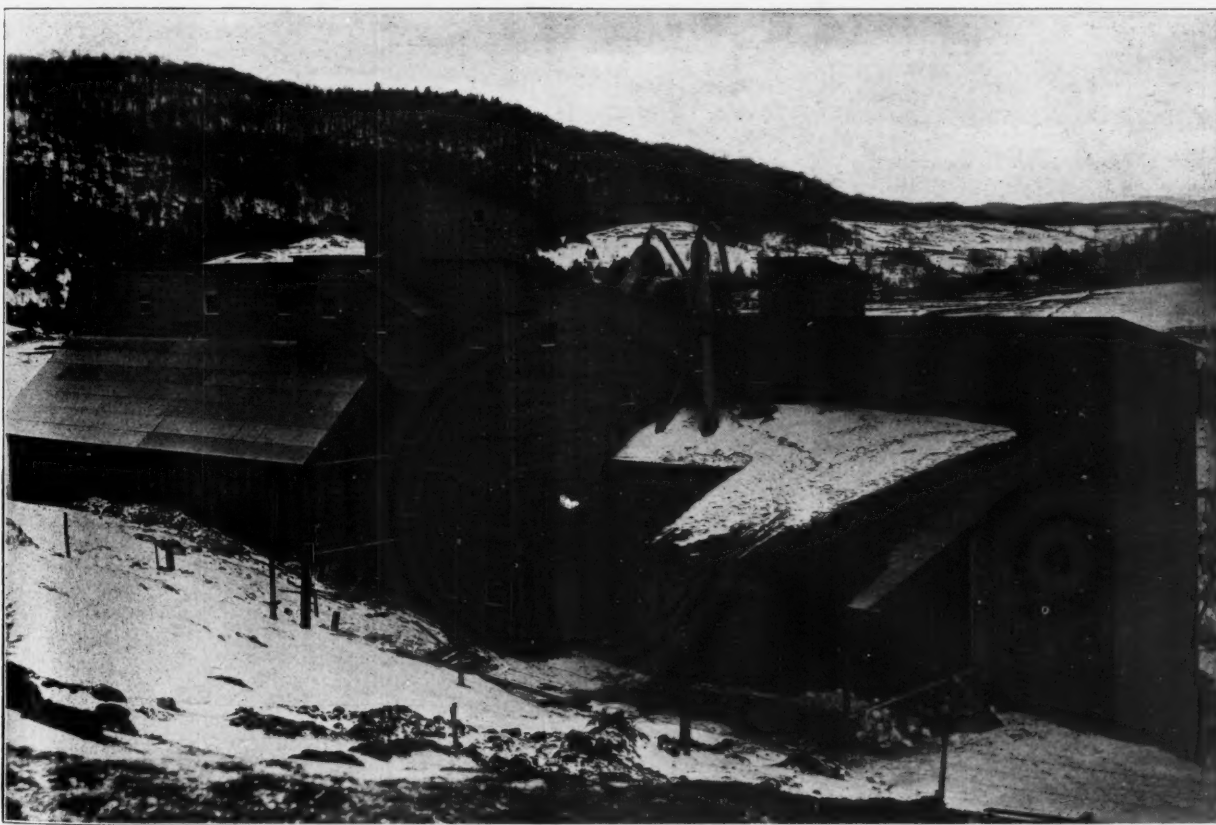


Fig. 9—Rear view of plant. The talc rock is dumped from carts into the hopper in the foreground and crushed to about 1½-in. size; this material is stored in bin at left of picture; bin has sloping floor corresponding with ground contour

fully re-opened in the future for only the talc and not the grit was removed in the early mining and a test pit from the surface beyond the limits of the old workings, has encountered good talc. The eventual development of a large body here would practically eliminate the present haulage cost.

The main talc-rock body is a typical lens striking roughly NE-SW, and dipping to the west at an angle varying from 55 degrees to vertical. Outcrops of talc can be followed for over one-half mile and seem to indicate a continuous body. Underground workings have proved up a block of solid talc and grit at least 1,500 ft. long, 200 to 250 ft. wide, and 130 ft. deep. The total probable tonnage for this deposit from evidence now at hand is ac-

cording to published report about 4,250,000 tons. This is the largest single deposit so far discovered in Vermont. The lens is bounded by walls of serpentine. Veins of a very pure white talc varying from one to 30 ft. (average about six ft.) in width line the walls, and the core is of the typical grit. Both the grit and talc are of exceptional quality and color.

Mining Method

The deposit was originally opened by a small shaft near the east wall, which was started as a vertical shaft, but its inclination was changed in depth to conform with the changing dip of the wall. The old shaft with its steam-driven hoist, compressor, and pumps in time deteriorated so that it was decided to sink a new

shaft and equip it entirely with electrically-driven machinery. The new installation is now completed and the old shaft and plant abandoned.

The new shaft was sunk at a dip angle of 68 deg. in the grit core. It was cut 6 ft.x12 ft. in the clear and divided into two compartments, a skip-way and a ladder and pipe-way. The skip-way is equipped with a two-ton, steel, 36-in. gauge, self-dumping skip. The workings from the old shaft were on the 30 ft., 60 ft. and 100-ft. levels, but as the upper levels are now largely abandoned, connection is made only with the 100-ft. level. A 130-ft. level is being cut to connect with the old shaft in order to drain the upper workings to the new shaft. From the shaft, drifts have been run in



Figs. 10-13—Interior views of mill. 10—Conveyor for recovering raw material from side bins, and on the right, wood-stave silos for finished product. 11—Bagging machines below the silos. 12—Raymond mills and air separators. 13—Newago screens

each direction following the east back wall. At several points along these drifts, cross-cuts have been started toward the west or hanging wall, but the longest of these cross-cuts, over 190 ft., has not struck the other wall. From the cross-cuts drifts are cut leaving longitudinal ribs 20 to 25 ft. wide as pillars. The drifts and cross-cuts are cut about 7 ft. high and 20 to 25 ft. wide. No timbering of any kind is needed. Raises, 20 to 25 ft. square, at an angle of about 45 deg. with the horizontal are put up at irregular and infrequent intervals. The pillars can be removed only when the mine is worked out. Here again, as noted in several other mines, practically all of the ore is obtained from large-sized development openings.

The rock is shot down on a layer of planks which keep it dry and prevents mixture with impurities. Large blocks are usually shot down in raising and much secondary blasting is necessary. From the headings, the talc is trammed to the shaft in 24-in. gauge, steel, rotary, end-dump cars holding about 1,800 lbs.

At the top of the shaft, the skip dumps automatically into a chute leading to a large wooden bin which has storage capacity for 400 to 500 tons of rock. This bin is provided with three gates on each side so that the loading of trucks or wagons need never be delayed.

Drainage is not a serious problem, for the mine may be kept dry by pumping an average of 60 to 80 gal. per min. for eight hours. The new pump is a triplex 5-in.x 8-in., 100-gal. per min., driven by a direct-gear, 10-h. p. electric motor. Compressed air for drilling is furnished by an 8½-in.x9-in. single-stage compressor, belt driven from a 25-h. p. induction motor. The hoist is two-tons capacity, geared to a 25-h. p. electric motor. The electric current used is 550-volt, 3-phase, 60-cycle, alternating current furnished by a hydro-electric plant at Morrisville, eight miles from Johnson.

From the mine, the talc is hauled on contract by wagon or motor truck to the mill. Plans were made some time ago and a right-of-way obtained for an aerial tramway connecting the mine and mill, but the project has been abandoned, at least temporarily.

Milling (Old Mill)

At the mill, the talc is unloaded into a large storage shed, from which it is loaded by hand onto a belt conveyor. The conveyor is made in sections so that the farthest end may be reached when the shed is nearly empty. The belt conveyor feeds the rock to a No. 4 jaw crusher from which the product is re-crushed in a Sturtevant rotary crusher. The crushed rock is then elevated to four crushed rock bins holding two to four tons apiece. Two bins feed two Sturtevant 30-in. ver-

tical emery mills and the other two feed two Raymond No. 0 pulverizers or "cage mills." One emery mill and one pulverizer feed one 6-ft. Raymond air separator and the other pair feed a similar but separate separator. The finished products from the separators are bagged by a Richmond and a Huntley packer, while the tailings are put through separate Newago screens. The screen oversize is put through a third Newago screen from which the tailings are re-ground. The three Newago screens are 60-mesh and produce a coarse product which is elevated to a 120-ton bin and then bagged by hand. All machinery in the mill is electrically driven.

The capacity of this mill varies from 70 to 110 tons of fine talc plus 20 to 30 tons of the coarser product per 24-hour day, depending upon the grade of rock received.

Noteworthy features of the mill are the fact that no dryer is needed and the large capacity for the size of the mill.

New Mill*

At the new mill the rock from the mine is dumped into a receiving hopper shown in the foreground in the view Fig. 9. This hopper discharges its contents through a reciprocating feeder into a jaw crusher, the output of which is taken by a continuous bucket elevator into a rotary crusher which prepares the rock for the pulverizers or mills.

A conveyor and elevator carry the crushed talc either to a reserve storage bin which has a capacity of 2,700 tons or to a service bin for discharge by gravity into the mills.

The reserve storage bin is built on the side of a hill to provide a sloping floor to facilitate reclaiming. The view Fig. 10 shows the reclaiming conveyor by means of which the reserve supply is taken to the service bin above the mills. This same view also shows the wood-stave storage silos for finished product.

The product of the mills is stored in seven overhead storage bins, five for the various grades of finely pulverized product, and two for tailings. The tailings are sized through screens before they are discharged into the bins. The rejects are returned to the service bin or to the reserve storage bin for re-grinding.

The view Fig. 11 shows the bag packers under the storage bins for finished product for immediate loading in the cars thus doing away with storing and re-handling. The exterior of the shipping platform is shown in the view Fig. 8.

All machinery is motor-driven and arranged to eliminate hand labor as much as possible. In the selection and design of handling and pulverizing equipment, machinery was installed which would

maintain the quality of the high-grade rock both for color and slip.

Personnel

The officers of the American Mineral Co. are: F. S. Rix, president; H. A. Macbeth, general manager; J. R. Gordon, vice-president, and Claude B. Ace, treasurer.

The new plant was designed and built by the Guarantee Construction Co., 140 Cedar Street, New York City.

Sequel to Trap Rock Company's Big Blast in 1919

READERS of ROCK PRODUCTS may recall the description of a 40-ton blast of dynamite at the quarry of the Trap Rock Co., Dresser Junction, Wis., in the summer of 1919. This blast was witnessed by the editor and described in ROCK PRODUCTS, August 16, 1919. It was said to be the largest blast ever made in the Northwest and ranked among the big ones anywhere.

The following from the St. Croix Falls "Standard" of April 4, 1921, forms an interesting sequel to the previously published description of the blast:

Miraculous Escape

While drilling tunnels in the large and solid bank of rock for the Trap Rock Co., located midway between here and Dresser Junction, a workman made a small blast to remove some difficult object in the formation of the rock which made further progress in the work a hindrance. After the blast the workman was nearly overcome by gas and was forced to retreat to the open and partake of the free air.

In gaining his freedom and the fresh air he soon felt sick and dizzy and so made his way home. The next morning the foreman of the quarry put another crew of men in the tunnel to work, not knowing the happenings of the previous day. After doing some more drilling and picking of rock in the tunnel another charge of dynamite was placed, and after removing the debris, the workmen discovered they had encountered some two feet of packed earth. It was behind this that four tons of dynamite were discovered to be in as good condition as the day when it was placed there.

And it was this two feet of dirt that saved the lives of some 20 workmen last Friday at the quarry of the Trap Rock Co. when their blast was made to make further progress in the work in the tunnel.

In the summer of 1919 the company had a contract with a dynamite company in the East to place and blast some 40 tons of explosives, the largest amount of dynamite ever used in one blast at any one time. It was said at the time by officials of the company while at the scene of the explosion that there were some four or five tons that had not been discharged. And now in making preparations for another big blast to take place in May the workmen located four tons in one pocket that was not disturbed.

The contents of the find will be removed and replaced with a fresh supply. The explosion to take place in May will contain 25 tons of dynamite.

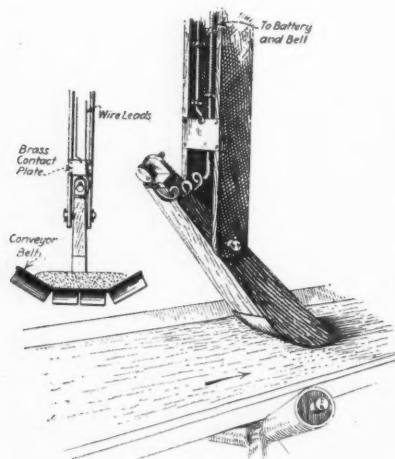
*Information furnished by the Guarantee Construction Co., New York City.



Hints and Helps for Superintendents

Alarm Bell for Belt Conveyor Stoppages

AT THE PLANT of the Tintic Milling Co. at Silver City, Utah, an ingenious device has been arranged to indicate by the sounding of an alarm bell the discontinuance of the stream of material upon a moving conveyor belt. At this plant the finely crushed ore is fed from different bins upon belt conveyors which discharge upon another conveyor. This in time discharges into a bucket elevator and this into a bin. It is necessary to mix the ores in definite proportions, depending upon the respective



Simple device of a Utah mining man to warn of stoppage of flow of material on conveyor belt

analyses, together with a fixed proportion of finely pulverized coal. This is done by regulating the feeder streams from the various bins. As long as the flow of material continues the final mixture will approximately reach the desired proportions. An interruption of any one feed stream would interfere with the proper mixture. The device is a short block of wood pivoted above its center of gravity. On the end is a simple electrical contact that completes an electrical circuit when the end of the block resting upon the ore stream falls, due to the absence of material. By means of an adjustable brass bolt the device can be regulated so as to give an alarm when the depth of material upon the conveyor belt changes even slightly. T. P. Holt, superintendent of the plant, states the device serves its purpose exceedingly well.—"Engineering and Mining Journal."

Life Preservers for Gyratory Crusher Yokes (Spiders)

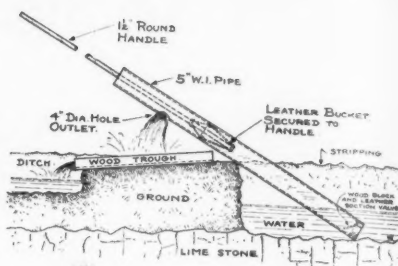
WHAT SEEMS to be a standard article of commerce in some sections of the East is seldom seen in other parts of the country and may be new to many crushing plant superintendents. That is the manganese-steel saddle for the head and yoke, or spider, of a gyratory crusher, as shown in the accompanying view.

This is made to fit standard size yokes, and the fit is a snug one, too, so that only two or three bolts and a strap around the outside end of the yoke are required to hold it in place. The saddle protects the head and yoke from the blows of falling rock and not only lengthens the life of these parts, but is just so much insurance against breakages that put the crusher out of commission for a piece.

The view shown herewith was taken at one of the Upper Hudson plants of the New York Trap Rock Co., New York City. These are limestone crushing plants, so its use is not confined to the trap rock crushers. The vice-president in charge of operation of these plants is James M. Shaw.

Home Made Pump

DURING the stripping operations of the new pit quarry recently opened by The Luckey Lime and Supply Co., Luckey, O., considerable surface water had to be contended with. A pump had been ordered but the railroad tie-up prevented it from getting there in time to



Home-made drainage pump

drain the water from the area being stripped. To overcome this, C. C. Martin, general manager of the company, designed and installed a very simple and cheap pumping device as illustrated above.

Unusual Agitated Sand Settling Box

THE ISLAND SAND AND GRAVEL CO., Columbus, Ohio, has developed an interesting type of agitated sand settling tank, which is claimed to give a remarkably clean and uniform product. The essential elements of this device are shown in the views herewith.

The device consists of a hopper-shaped box with a chain bucket elevator leading out of the bottom, set at a slight inclination from the vertical, to a two-way chute, that deposits the clean sand in one or both of two car loading bins on opposite sides of the plant. The sand from the battery of screens flows into the hopper by means of a steel chute.



Armor plate protection for gyratory crushers

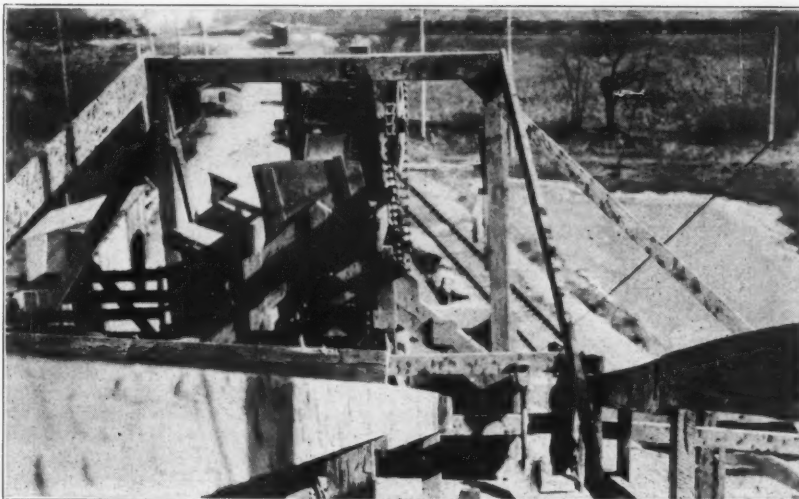
The wash water which comes with the sand and silt overflows at the opposite side of the hopper or settling tank into a waste-water flume. This, of course, disposes of the silt and clay.

The chain of perforated buckets takes the clean sand as it settles in the bottom of the tank and elevates it to the chutes already referred to. The material in the settling tank is, of course, kept agitated by the moving buckets, resulting in a very thorough washing of the sand.

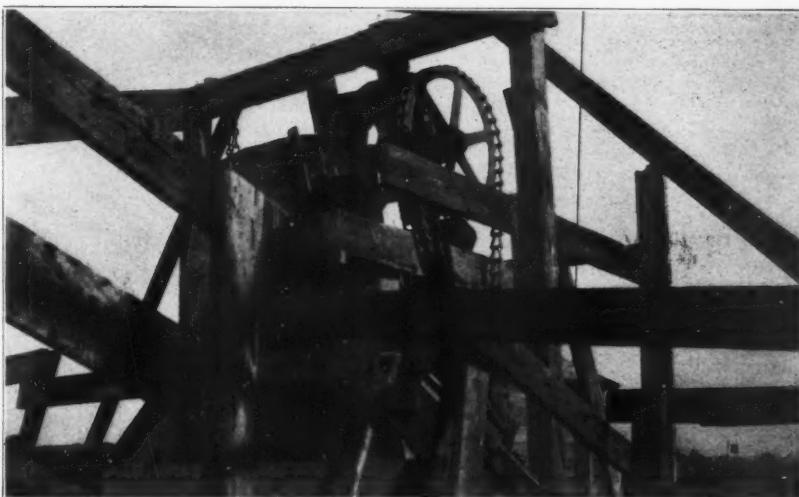
The whole trick to the device is the bucket elevator bearing at the bottom of the settling tank. Any ordinary bucket elevator would wear away very rapidly if working in a mixture of sand and water.

Here the chain-bucket elevator operates on a single center sprocket, the shaft of which is inserted in two sand-proof stuffing boxes. The stuffing boxes are made of two short lengths of $2\frac{1}{2}$ -in. pipe, embedded in the concrete sides of the settling tank. The outside ends of these pipe sections are covered with ordinary screw caps. The inside ends also have screw caps with holes punched through them large enough to take the ends of sprocket shaft. The interior of the pipe sections are made the same as any stuffing boxes, and packed with a little oiled waste they keep out the sand indefinitely.

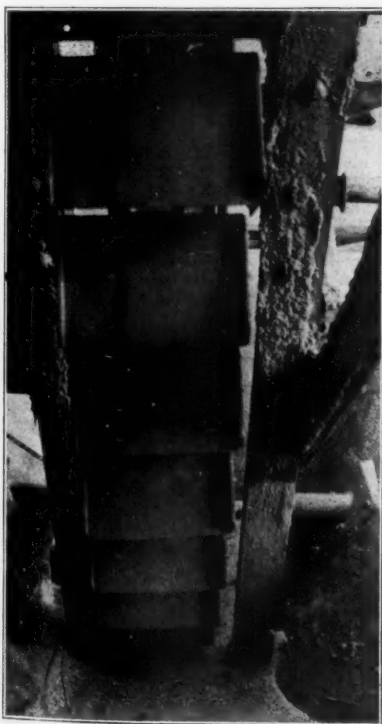
The Island Sand and Gravel Co. is a subsidiary of the Consumers Supply Co. of Columbus, of which Herbert R. Gill is president and general manager. H. H. Layton is superintendent of the sand and gravel plant.



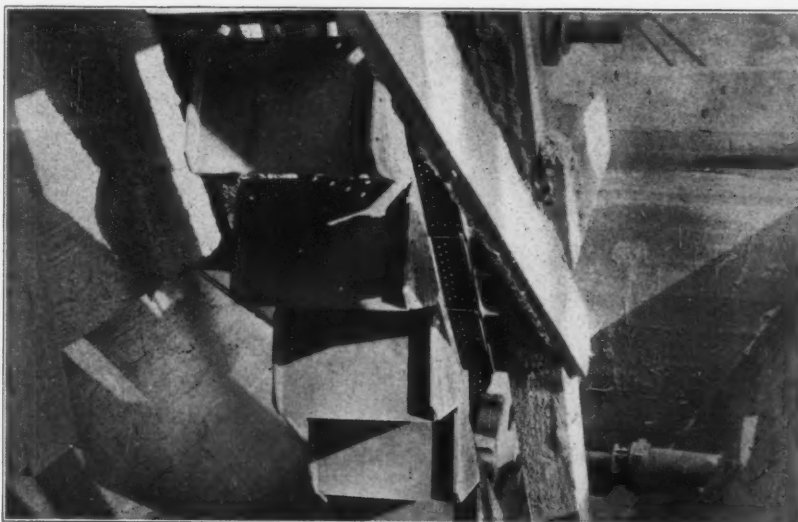
Top view of sand separator showing two-way spout



Another view of the conveyor and spouts



Bottom of settling box



Perforated buckets and shaft-bearing stuffing box

Novel Washing and Screening Plant for River Sand

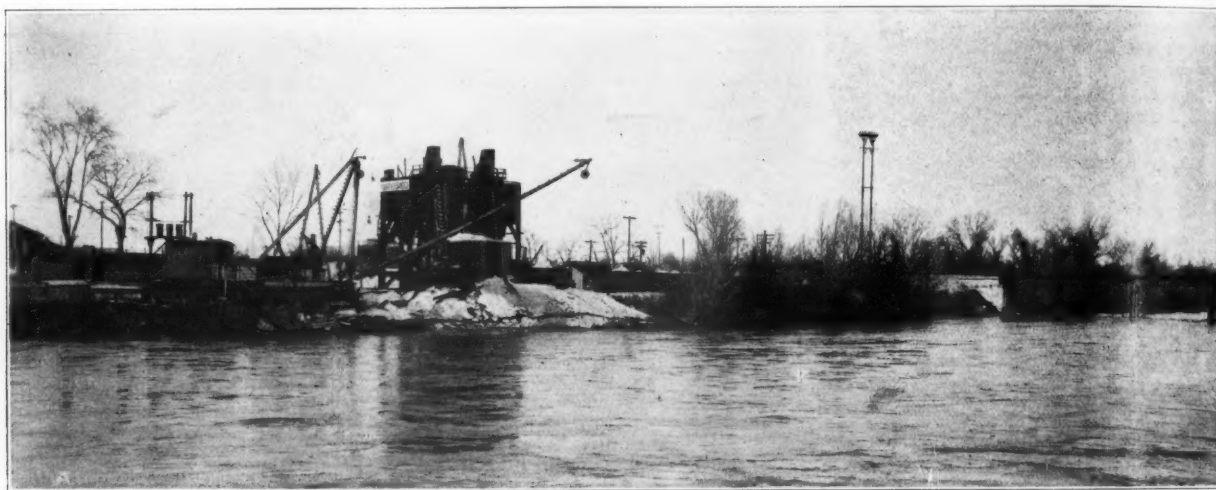
Description of the New Plant of the Yuba River Sand Company, Marysville, California—Submerged Rotary Screens a Feature

AT MARYSVILLE, CALIF., Yuba County, on the north channel of the Yuba River, and located on Western Pacific Railroad Co.'s tracks, with transfer to the Southern Pacific and Sacramento Northern Railroads, the Yuba River Sand Co. has this past year completed the installation of a most efficient sand and gravel washing and screening plant. As

this plant applies a new method of washing and segregating the sand, the following description will be of considerable interest to the trade.

The large sand deposits in the Yuba River Channel are largely the results of mining in the upper reaches of the river by the hydraulic process and where hundreds of millions of cubic yards of mate-

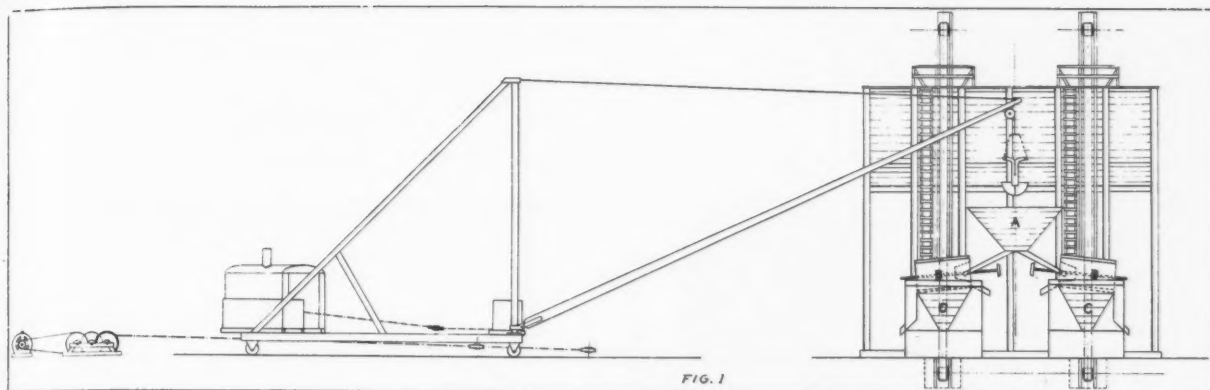
rial were washed out by the miners into the river channels in the search for gold. These washings caused filling of the river channels until the year 1905, since which date (at the site of Yuba River Sand Co.'s plant) a scour has occurred each year, but there is still something like 25 feet of deposit at this particular point, and the constant flow of this material by the ac-



General view of the new plant of the Yuba River Sand Co., Marysville, Calif.



View from tracks above the plant showing ground storage in the rear



Elevation of plant showing stiff-leg derrick excavator and manner of feeding hopper

tion of the river guarantees an inexhaustible supply for the operations of this plant for many years to come. The cessation of hydraulic mining many years ago and the washing of these deposits in the river channel by the annual winter freshets since then, has resulted in the elimination largely of all silt and earth deposits, leaving only the fine and coarse aggregate, guaranteeing an improved quality each year of the material handled by this plant for commercial purposes.

The company ships its concrete, mor-

tar and engine sand and concrete mix (gravel and sand mixed) within a radius of 200 miles and reaches into the States of Oregon, Nevada, and Utah.

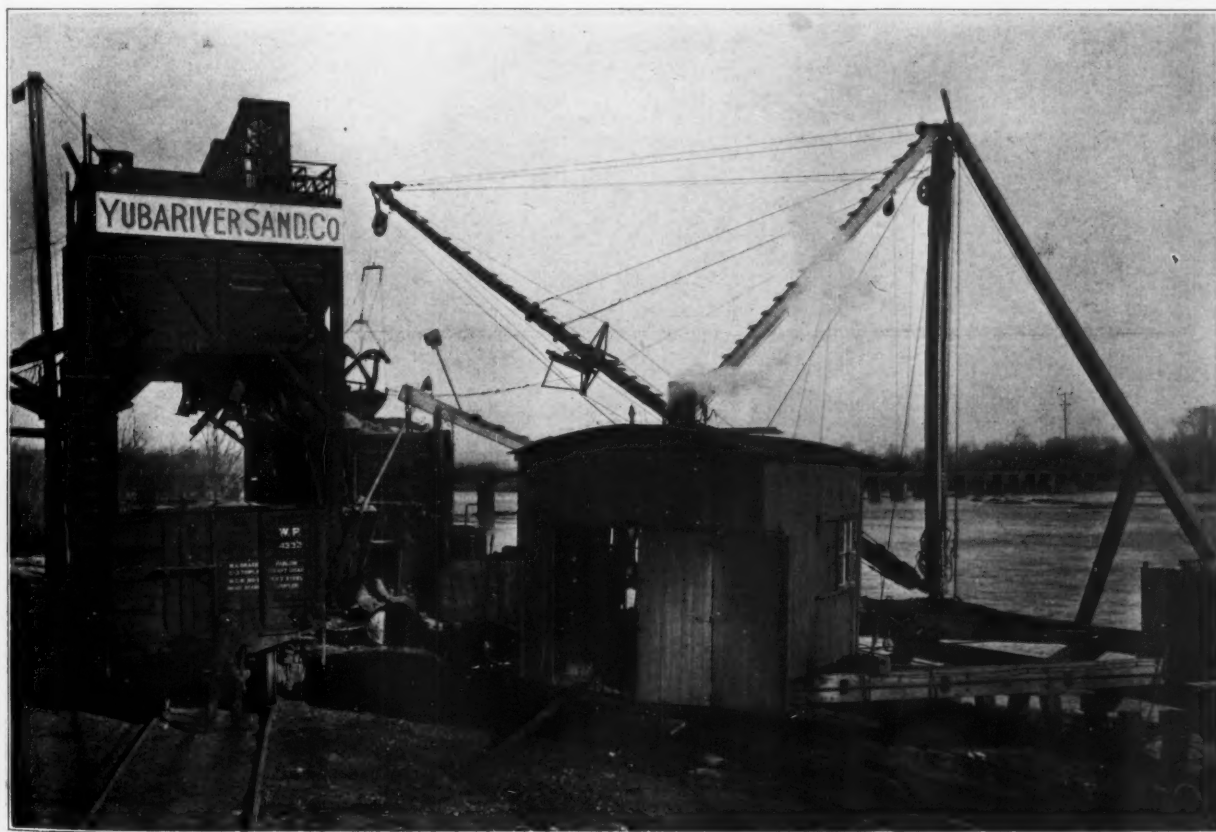
The new plant has a daily capacity of 1,000 tons of $\frac{1}{4}$ -in. and $\frac{1}{8}$ -in. washed and screened sand per 10 hours, requiring only three men to operate. Two shifts are employed in the summer season.

The sand is excavated from the river bed by means of a 1-cu. yd. "Stockton" clam-shell bucket operated from a stiff-leg derrick and a double-drum hoist.

Hoist, bucket and derrick are portable and travel on wide-gauge track as shown on the diagram.

At present this double-drum hoist is operated by a 30-h. p. steam engine, but is now being equipped to employ a 75-h. p. electric motor with solenoid brake and silent chain drive, which will prove a more efficient operation.

The clam-shell bucket deposits its load into the washing plant, which has at the top a large receiving hopper, protected with grizzly bars. From this hopper the



Close-up of plant. This plant has a capacity of 1000 tons in 10 hours

sand is fed by means of water jets and gravity to either one of the two screening units, or both.

When available sand is excavated within reach of the stiff-leg derrick in low-water periods (June to November) additional material is supplied to within reach

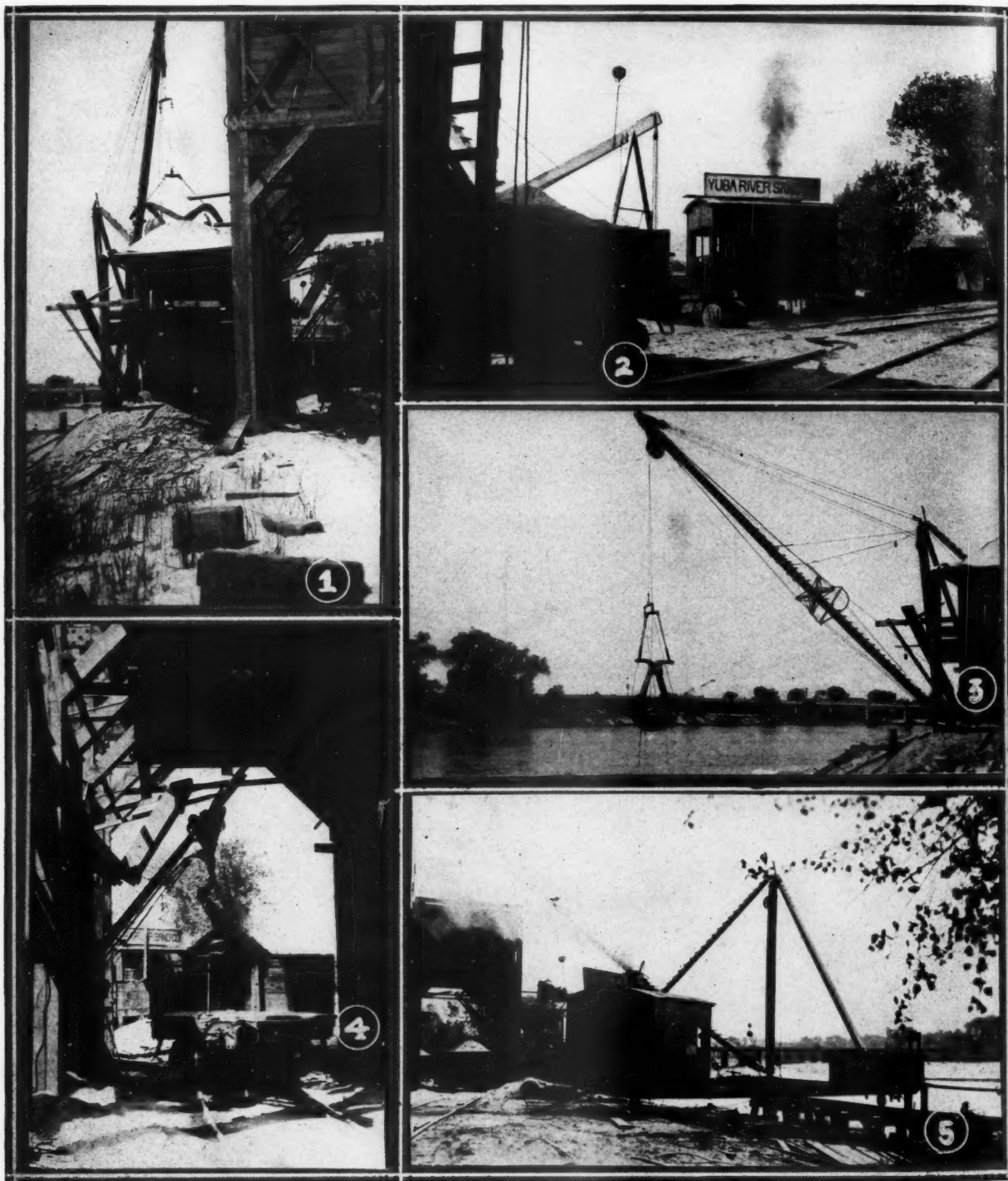
of the clam-shell bucket by means of a $2\frac{1}{2}$ -cu. yd. surface scraper operated on a span of approximately 600 ft., taking the sand from the opposite river bank and dragging it into the channel, where the clam-shell bucket is operating.

Diagrams of the plant show the travel-

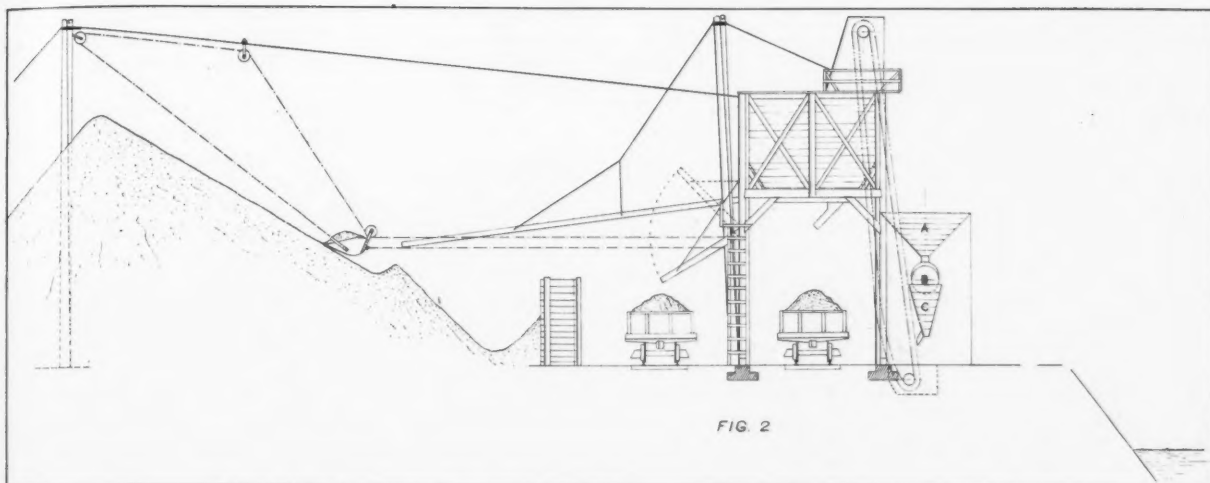
ing stiff-leg derrick with hoist and clam-shell bucket, the surface scraper, washing plant, elevators, bunker and ground storage.

Scheme of Operation

Referring to the operation of the plant. From the receiving hopper marked A on



(1) Plant during construction, showing type of washing tanks; (2) Derrick house; (3) Yuba River; (4) A temporary device for loading from washing tanks; (5) General view



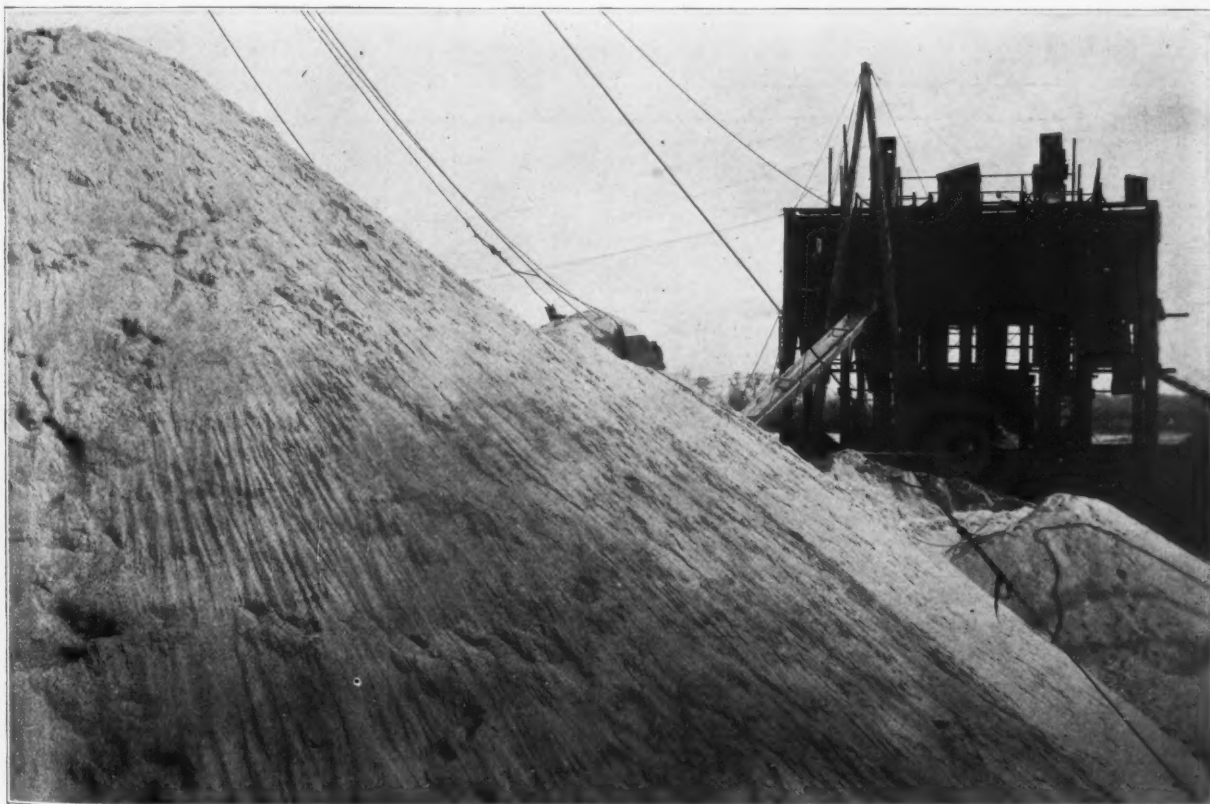
Special device for placing sand in storage and loading sand out of ground storage

washing plant, the material as previously stated is fed into the screening unit. The screens being placed directly above the washing tanks and opposite each other. The screens marked **B** are of a different design from any other screens on the market. Each screen is mounted on a heavy steel shaft and driven by means of bevel gears, chain drives being located directly underneath the hopper. At the receiving end of the screen is mounted a

conical screen which has the object of receiving all the material and rejecting anything larger than $2\frac{1}{4}$ -in. diameter. The perforations in the conical screens are particularly for the purpose of rejecting any foreign matter that may be excavated with the sand. From this conical screen the material is dropped into a revolving screen which has a perforation of $\frac{5}{16}$ -in. diameter. This in turn rejects all the gravel $\frac{1}{4}$ -in. to $2\frac{1}{4}$ -in. at the oppo-

site end and the fine material going through this perforation is later screened through the outer jacket of the screen which is made with perforations of $\frac{1}{8}$ -in. diameter.

The new feature employed in this plant is that the screens are set directly over the sand-washing tank and in such a way that the screening areas of the screens proper are submerged in the water, and the screening takes place in the water and



Ground storage for 25,000 tons of sand in the rear of the plant

not as customary in other screens by means of spraying water on the material in the screens. This method is not only giving the sand a thorough washing, but it has proven to give a much greater capacity than could be obtained under the ordinary conditions where the screens are not submerged. When considering a capacity of 1,000 tons in 10 hours from two screens, the inner screen being of 40-in. diameter, 7 ft. long, 5/16-in. perforations; the outer screen 44-in. diameter, 7 ft. long, with 1/8-in. perforations, the tonnage is far in excess of what could be obtained by ordinary methods of spraying the material with water.

The sand tank, or washing tank marked **C** on the diagram, is designed in such a way that it will handle the different grades of sand, and as this tank is constantly filled with water, the silt, etc., flows over the top and is returned to the river. The washing or settling tank is designed so that the bottom has very steep sloping sides, approximately 60 degrees, and is lined with steel plates. At the bottom or apex of the tank there is an automatic

valve for discharging the sand, and the discharge from this tank is a sand pulp with a very small percentage of water. The design of the tank gives the sand an opportunity to pack at the lower end, and the discharge is so regulated that the outgoing sand will not exceed the incoming sand. An arch is formed at the bottom of the tank, thus preventing the water rushing through the discharge valve. From the tanks the sand is delivered directly into two elevators extending to the top of the storage bunker.

These elevators are shown on the diagram. Each elevator is 50-ft. centers, having steel buckets 13-in. wide, carried on heavy rubber conveyor belting. Both elevators are driven from a 20-h. p. motor located directly on top of the bunker, and the drives are so arranged that both elevators can be operated at the same time or either one can be cut out at will.

The storage bunker which is 34 ft. high, 40 ft. long, and 20 ft. wide is made with two compartments. The construction of this bunker is such as to allow a railroad clearance.

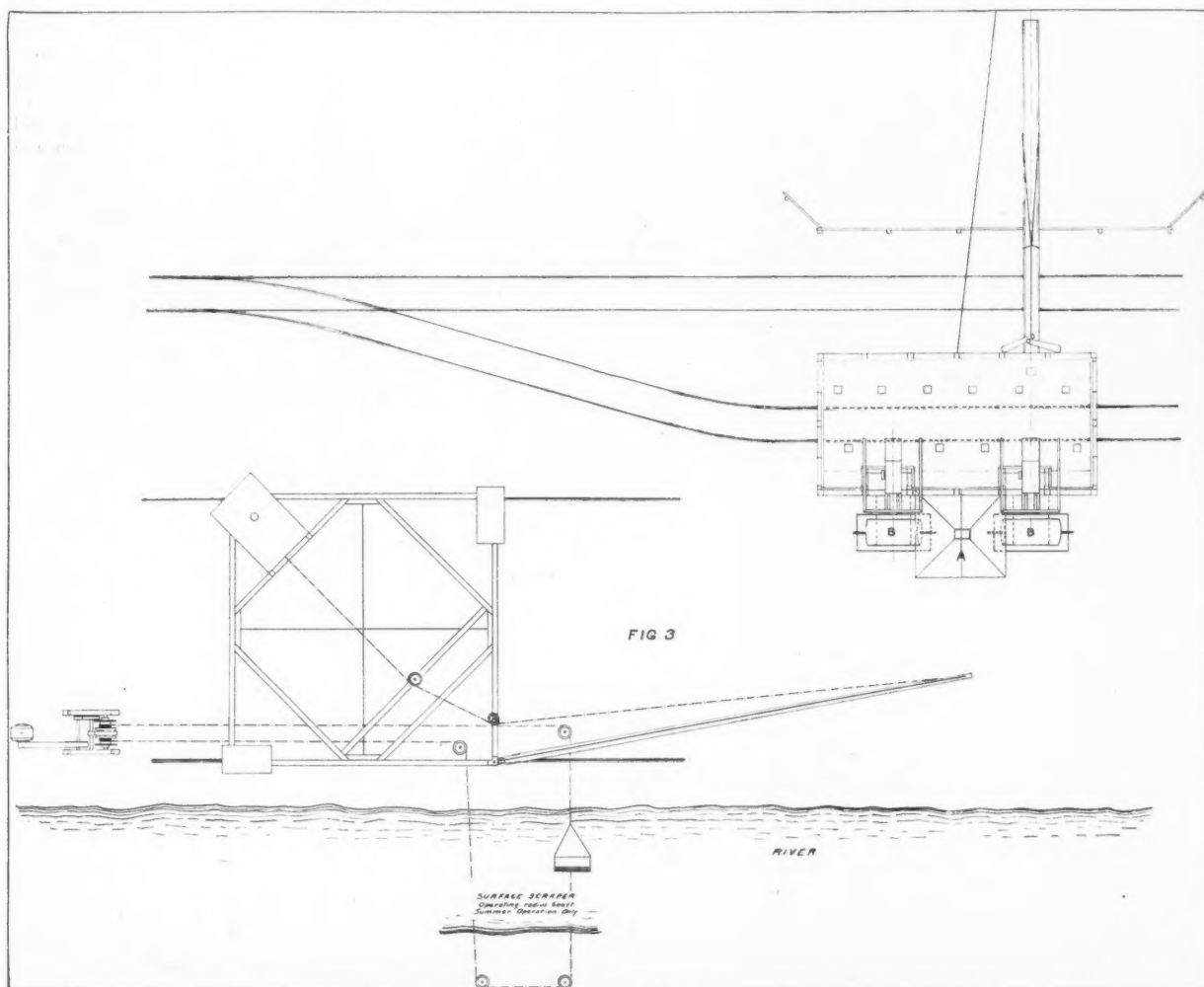
The material is loaded into the cars by means of slide gates located at the bottom of the bunker and operated by levers from a platform.

Referring to the screening plant, the two screens as well as the centrifugal pump for supplying water to the receiving hopper and screens, are driven by means of a 10-h. p. motor. The screen drives are so arranged that both or either one can be operated at will.

All transmission, elevating and screening machinery used throughout the plant was manufactured and furnished by Bodinson Manufacturing Co., 11 Minna Street, San Francisco, Calif.

As shown on the diagram a ground storage has been installed with an approximate capacity of 25,000 tons. This affords winter operations while sand is moving in the river and insures prompt deliveries in the event of shutdowns, etc.

The directors of the Yuba River Sand Co. are: L. L. Green, president; Emery Oliver, vice-president, and W. T. Ellis, secretary. A. L. Brownlee is manager and Wm. C. McBurney, foreman.



Surface scraper for taking material above water level on the opposite bank of the river

Limestone Crushing Plant With Novel Crusher Arrangement

Consolidated Stone and Mining Co., New Castle, Pa., Has Gravity Feed Through Three Gyratory Crushers

ON THE PROPERTY of what was once known as that of The Beaver Valley Lime Co., two and one-half miles south of Wampum, Pa., is being constructed one of the most modern stone crushing plants in this section of the country. This new organization is known as The Consolidated Stone & Mining Co., and is made up of New Castle men. The plant offices of this company are at Wampum, with main office in New Castle.

This plant will furnish flux, agricultural and commercial crushed limestone, the latter being especially in demand through-

By George M. Earnshaw

450 tons per hr. From this crusher the stone passes through the scalping screen, which is a specially constructed screen of double strength, 12 ft. long and 60 in. in diameter. The rejections from the scalping screen are run by gravity to another crusher. This crusher is a No. 7½ gyratory, fully capable of taking care of the over-size from the scalping screen. This unit will be set to discharge stone, which will be chuted to a No. 6 gyratory. This crusher will discharge 1½-in. stone into the elevator, to the sizing screens.

Elevator and Sizing Screens

The bucket elevator is 40 in. wide, with 70-ft. centers, having a rise of 54 ft.

From this elevator, the stone is discharged into two revolving, dust-jacketed 24-ft. by 60-in. screens, which will screen the stone into five different sizes. These sizes will be as follows: Dust to ¼-in., ¼-in. to ¾-in., ¾-in. to 1½-in., 1½-in. to 2½-in., and 2½-in. up.

Bins and Tracks

Each size will be discharged into a 100-ton bin, with the exception of the flux, which will be chuted into a 200-ton bin. The two remaining bins will be used for emergency storage purposes.

Two railroad tracks run directly under the bins, while a third track parallels the outside of the building. This track will be used chiefly for loading flux stone, although the ¾-in. to 1½-in., or the 1½-in. to 2½-in., may be loaded on it. With this system, it is possible to load three cars at a time.

The tracks are graded to a one and one-half per cent grade, which does away with the necessity of having a switching engine. The tracks above the plant provide accommodation for 30 empty cars, while below the plant adequate space has been reserved for loaded cars.

Plant Construction

Including foundations, piers, retaining and wing walls, this plant contains 1,600 yds. of concrete. All timbers used in the construction were taken from the company's own timber tract and sawed at their own sawmill.

Immediately over the No. 12 crusher are placed two unusually large timbers, 30 ft. long, which extend over the dumping track. On top of these timbers, two heavy rails are laid, this making a substantial track for the traveling chain hoist. This hoist is of 20-ton capacity, and at times will be available to serve in removing the shaft and head, and spider, and also to replace dump cars that are likely to get off track at this point. Timbers are likewise arranged over the Nos. 7½ and 6 crushers. One 12-ton hoist taking care of both crushers.



Geo. S. Earnshaw, general superintendent

out the surrounding territory. When completed, the plant will have a daily maximum capacity of 2,200 tons, although the present plans of the company are to maintain only a daily average of 1,500 tons.

The most remarkable feature of this plant lies in the fact that it is very complete in its compactness. For, instead of having separate buildings for the crushers, scalping screens and bins, compressor, and sizing screens, it is so constructed as to have all its machinery and equipment housed under one roof.

Crushers and Scalping Screens

The initial breaker is a No. 12 Gates gyratory crusher, having a capacity of



A. L. Patton, superintendent

Another splendid feature of this plant lies in the fact that when designing it, consideration was given to a possible future installation of two more crushers. These crushers will be of the same type and size of the secondary breakers already installed. With this arrangement, the initial crusher may be operated to full capacity, resulting in a daily output of 4,500 tons.

Power

The power will be supplied by the Pennsylvania-Ohio Electric Co., whose high-tension lines pass directly by the plant. The power will be received at the substation at 22,000 volts, and will be stepped down to 2,200 volts, 60-cycle, 3-phase. The installation of the service will

include separate recording meters for each operation, thereby permitting a close and accurate account of the consumption of each unit.

Due largely to the fact that each operation is driven by a separate motor, the plant gains the feature of flexibility, as may be seen by the fact that any one operation may be operated individually

and will not affect any of the other operations. This is an especially potent factor, because it is often desired to stop certain machines temporarily, to make repairs, change screens, or to reduce the output.

Quarry

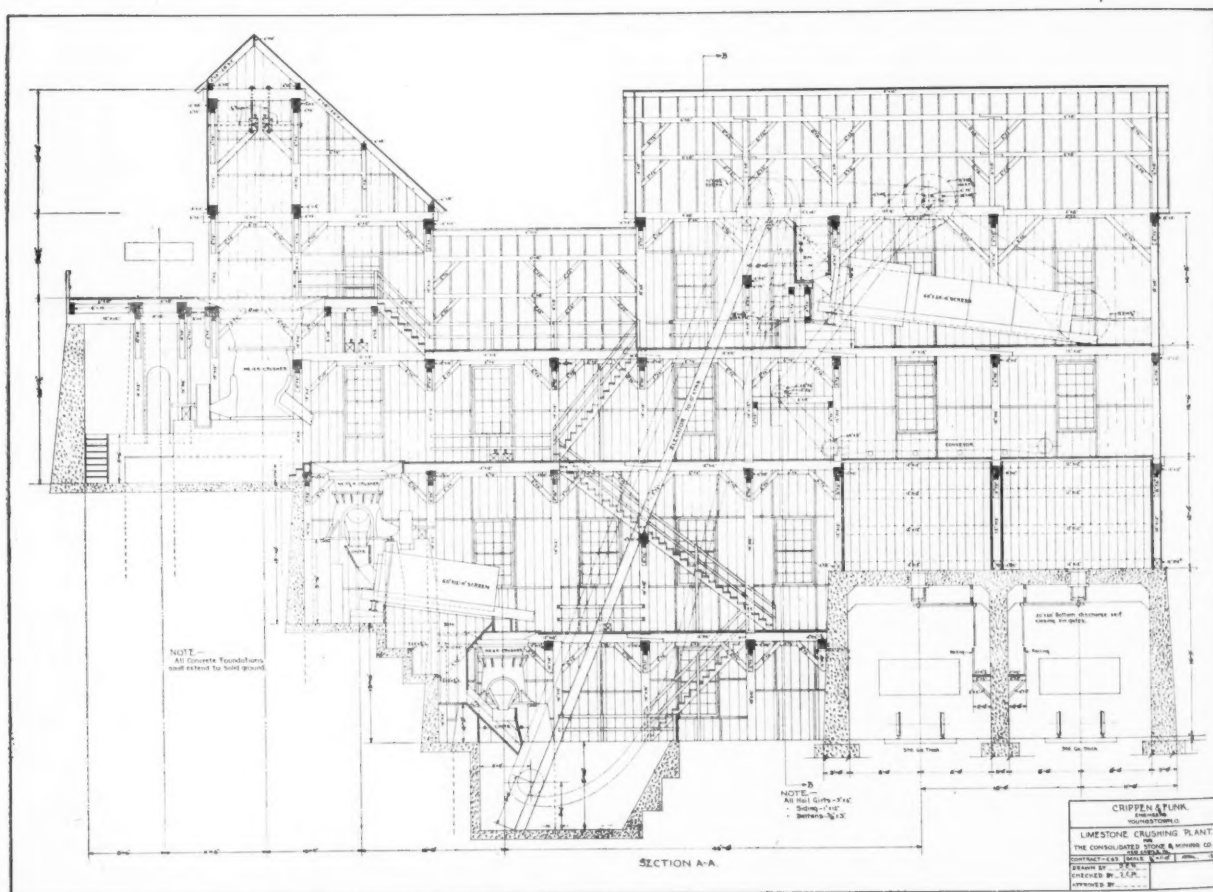
The stripping equipment is composed of one 70-ton steam shovel with 2½-yd.

dipper, two 18-ton saddle-tank locomotives, and twenty 4-yd. heavy duty, two-way, steel-framed dump cars. In addition to this equipment, a heavy-type electrically-driven well drill will later be installed.

The equipment in the quarry proper will comprise one steam shovel of the same type as that used in the stripping



Two views of the new crushing plant of the Consolidated Stone and Mining Co., New Castle, Pa.



Elevation of the plant of the Consolidated Stone and Mining Co., New Castle, Pa. Note, the scalping screen as the plant was finally constructed is between the No. 12 (primary breaker) gyratory and the No. 7½ gyratory instead of the place shown on the elevation

operation, one 30-ton revolving steam shovel, two 20-ton saddle-tank locomotives, and twenty 5-yd. V-shaped steel stone cars. At present compressed-air drills will be used.

Miscellaneous Operations

In addition to this crushing plant, the company has on its property four modern well-equipped coal mines, from which all coal for quarry and stripping operations is obtained. This factor is in itself noteworthy.

Two lime-kilns, with complete modern equipment, will also be operated in connection with the crushing plant. The stone used in kilns will be taken from the

same quarry that supplies the crushing plant. The lime-kiln equipment includes 4-yd. two-way dump cars, and one locomotive. The maximum daily capacity of these kilns will be 500 bbls. each.

Plans have been drawn for a brick plant, which will be constructed within the near future. The plans for this plant are very elaborate, and no detail escaped the attention of the designer. The contemplation of erecting such a plant is fully warranted because of the fact that a 20-ft. deposit of brick shale exists on top of the stone. This shale is now being wasted to the extent of 1,500 to 2,000 cu. yds. per day, but in such a location that

it can be recovered when ready for its use in making brick.

Personnel

To George S. Earnshaw is given the credit for this modern layout. Guided by his ideas, Messrs. Crippen & Funk, consulting engineers, Youngstown, Ohio, drew up and completed the plans.

It is due chiefly to the efforts of Mr. Earnshaw, who is general superintendent, with the assistance of A. L. Patton, superintendent, that the construction of this plant was possible. W. S. Treser, formerly engineer of the City of New Castle, Pa., is the engineer in charge of plant construction.

Canadian Cement Situation

President of the Canada Cement Co., Ltd., Says Present Price Is Lowest Possible Without Further Declines in Other Materials and Supplies

COMMENTING ON THE CEMENT SITUATION, Senator W. C. Edwards, president of the Canada Cement Co., Ltd., said:

"This company has consistently endeavored to keep the selling price as low as possible. There is no doubt that last year we could have obtained a much higher price for cement sold, but we did not consider it the proper policy, and therefore, not to the permanent advantage of the company, our customers or the public.

"The policy has been, and is, to always keep the producing capacity of the plants well ahead of Canada's possible requirements for cement. This policy we feel on the whole is beneficial to our customers, to Canada and to the company, but we must recognize the fact in adopting this policy, that the company is not at the present time making as large profits as could be obtained if the company endeavored only to manufacture what could readily be consumed each year, and allowed the peaks of consumption to be imported.

"Always having a surplus producing capacity means that the company always has idle capacity, on which not only interest and depreciation have to be provided for, but also idle expenses, which, at times such as last year, are extremely heavy.

"As nearly as we can ascertain, the selling price of cement in Canada advanced less than it did in any country that produces cement. During the year 1920, the Canadian public purchased cement at a lower price than it was being sold for in England or the United States.

"To encourage building and the use of cement, it is desirable that the present price of cement be reduced, but it will be

impossible for our company to make any reduction in its present price of cement until such time as the principal commodities we use come down to an advance, compared with 1914, not greater than the advance in the price of cement. In other words, before the price of cement can be reduced, there will have to be a still further reduction in the cost of coal, supplies of all kinds, and labor."

Cement and Plaster Taxed in Montana

THE GOVERNOR of Montana has recently signed the cement tax bill which has caused considerable trouble for the legislature of that state. Briefly, the law provides for a tax of 4 cents a barrel on cement and 20 cents a ton on plaster manufactured or imported into the State of Montana.

Pennsylvania Road Bids Show Remarkable Decrease

BIDS ON HIGHWAY WORK in Pennsylvania which were opened on March 31 show a marked decrease when compared with those of February 18. Most of the bids opened in February were considered too high and were rejected. New bids were requested. These new bids, opened March 31, showed a decrease from the low bids of February of nearly 6 per cent.

One bid on approximately 67,000 lin. ft. of concrete road shows a decrease of 9 per cent from the February bid.

The total decrease over the low bids of February was \$314,074 on about \$5,000,000 in contracts for 72 miles of concrete pavement.

Cement Plant Adopts the Eight-Hour Shift

THE ADOPTION of the eight-hour day, with an hourly wage increase of approximately 20 per cent, was announced by Richard Hardy, president of the Dixie Portland Cement Co., in a talk to members of the night shift at Richard City, Tenn., recently, according to a local newspaper report. The meeting was held in the machine shop.

Mr. Hardy, in the course of his remarks, expressed gratification at the good production record made at the big Richard City plant in the past month, as a result of which he stated that a wage cut which was scheduled for April 1 has been postponed indefinitely. He stated that the condition of business made it impossible to promise adherence to any scale, or continuous employment, but added that no cut would go into effect as long as the Dixie selling force continued to function and the present excellent production record obtains at Richard City.

Mr. Hardy's remarks were brief, and he spoke intimately of matters affecting the future of the plant; he expressed pleasure at the abolition of the 12-hour shift, which he declared obsolete economically, and manifested a keen interest in the welfare of Dixie employees.

During a discussion of safety precautions, during which he urged co-operation in the prevention of accidents, Mr. Hardy paid a tribute to "Billy" Deakins, a Dixie employe who succumbed last week to injuries received at the plant. He declared the preservation of human life and the prevention of accidents as being of paramount importance.

Changes in shifts and readjustments of wage scales will be taken up at once by Dixie foremen, with the expectation of putting them into effect April first.

The shifts will begin at 6 a. m., 2 p. m., and 10 p. m., and it is stated that the change will not affect the 10-hour shifts. About 150 men, who are now working at 12-hour shifts, are affected.

Methods of Slate Quarrying in Georgia*

Machines Replacing Hand Operations—Uses of Georgia Slate

THE OLD SLATE QUARRIES in the Rockmart district of Georgia were operated by very crude and unsystematic methods. All slate was removed from the quarries by blasting with black powder. While skilled workmen are able to break slate into blocks of convenient size and shape by blasting, the amount of slate shattered and wasted is necessarily very large. At present the more progressive quarries are using cutting machines similar to those used in marble quarries. Such machines are most easily used where the cleavage is nearly horizontal or nearly vertical, but they may be constructed to cut at any angle.

Natural difficulties, such as faults, joints, shear zones, veins and dikes, occur in all slate quarries, and present individual problems for solution. In deep quarries the support of the walls is also difficult, but it is much more economical to support them by leaving pillars of slate or by artificial props than to let them cave in. Falls or slides of rock from the walls have been causes of great delay and expense at many slate quarries. The use of channeling machines instead of blasting makes operation much safer. The tunneling method used in France has been introduced at some quarries in the United States. This method not only avoids the removal of topping and danger of slides, but also provides working places of uniform temperature, protected from the weather, where the slate remains moist and unfrozen and in good condition for splitting.

Slate is taken from the quarries in blocks or slabs as large as can be handled. The slabs are sent to the sawing tables, or in some cases are sold in the rough state to slate-working mills.

The usual method of moving both slate and waste is by aerial wire-rope conveyors.

Manufacturing Processes

The slate slabs from the quarries are sent first to the sawing tables, where the rough edges are sawn off and the blocks cut to the desirable sizes. Slate for mill-stock, etc., is split to the proper thickness and planed, carved, or turned by appropriate machinery. That for roofing is made into blocks of convenient size, with one or more sawn edges, and sent to the splitting shanties.

*From a recent report of the Georgia Geological Survey.

By H. K. Shearer
Assistant State Geologist

The men engaged in making roofing slate are organized into "shanties," each shanty having three skilled workmen known as the block-maker, splitter, and dresser. The output of a shanty is five squares or more a day.

Recently a slate-splitting machine, the invention of Vincent F. Lake, has been introduced. This machine requires little skill to operate and makes commercial slate from blocks which could not be split by hand, thus reducing the cost and proportion of waste.

Roofing Slate

Roofing slate is always sold by the "square" in the United States, a square being the amount necessary to cover an area 100 feet square, when laid with a 3-inch lap. The usual sizes range from 7 by 9 to 16 by 24 inches. The number of pieces to the square ranges from 85 to 686, according to the size, and the weight of a square of slate of ordinary thickness is about 650 pounds. In France and England the unit used is the "mille," a mille being 1200 slates of any given size, plus 60 to cover loss by breakage.

The usual thickness of roofing slates is from one-eighth to one-fourth inch. Very strong slates may be split thinner than the average, but it is poor economy to split slates too thin, because of the breakage in handling and the likelihood of disintegration on the roof.

The selling price per square varies greatly, depending on the size and thickness of the pieces, color and other qualities of the slate, and also on the distance from competing quarries. Specially prepared slate of selected color or extra thickness and size may be worth several hundred dollars a square. "Architectural" slate ranges from three-sixteenth inch to 2 inches in thickness.

Red and green slates are quoted at higher prices than other slates of equal quality but of more ordinary colors. Georgia slates should bring prices well above the average, on account of the attractive color of the green slate and the high freight rates on shipments from competing quarries in Northern States.

Mill Stock

Mill stock slate is used for structural and sanitary purposes; including flooring, wainscoting, mantels, hearths, well caps, tiles, vats, sinks, laundry tubs, grave vaults, sanitary ware, refrigerator shelves, flour bins and dough troughs for bakers, billiard, laboratory, kitchen, and other table tops. These uses require a fine, even-grained slate, not too hard, with fairly uniform color and smooth cleavage, but preferably not highly fissile. It is sold in slabs from 1 to 3 inches thick. The price depends on the size, thickness, quality, and the work done upon it.

Electrical Uses

Slate is recognized as a superior material for electrical switchboards, bases for electrical machines, and other uses where insulating power and mechanical strength are needed. As a dielectric, slate falls far below marble, but on account of its superior toughness and ease of working, combined with lower cost, slate is more generally used.

The requirements for electrical slate are strength; good working qualities, so that it can be drilled and sawed without scaling; uniform composition, which is indicated by fairly uniform color; and high electrical resistance, which depends principally on the absence of magnetite and metallic veins. No electrical tests have been made on the Georgia slates, but the Conasauga green slate is rated as extremely low in magnetite content, and the Rockmart slate as very low. On account of the low magnetite content, good working qualities, and uniform color it is certain that these slates will prove satisfactory for electrical uses.

Other Uses

Slate for "other uses" includes school slates, blackboard material, tombstones, "inlaid slate," ground slate for use in composition roofing, and small quantities for special purposes. Slate used in brick making and ground slate for fertilizer filler might also be included.

The requirements for most of these uses are the same as for mill stock. Blackboard material, which makes up nearly half the value of slate classified under "other uses," and school slates require a rather soft gray slate with smooth cleavage and extremely uniform color and composition. All of these products are

supplied by a few quarries in Pennsylvania. The production of school slates amounts to more than 4,000,000 a year, most of which are exported.

Slate Waste

The waste at slate quarries producing only roofing slate amounts to from 75 to 90 per cent of the rock quarried. To say nothing of its lack of value, the handling and disposal of this large amount of material is difficult and expensive. In recent years numerous uses have been suggested and tried, but the problem is not yet solved.

Of first importance is the prevention of waste, by the use of cutting machines in the quarries and by substituting mechani-

cal for hand methods of working and splitting. Much of the slate wasted by quarries producing roofing slate exclusively is suitable for the smaller sizes of mill stock. Pieces too small for roofing slates may be split thin and used for veneers or for inlaid slate roofing, when backed by slate concrete or asphalt. Finely ground slate of suitable color is used for coating flexible roofing materials.

Slate topping and waste is suitable for brick and cement manufacture, but in most cases the quarrying of this material directly for use will be cheaper than handling the waste from slate quarries. This was found to be the case at Rock-

mart, Georgia, where both brick and cement plants were started with the intention of using slate waste, but the idea of producing slate was abandoned. Tests of slate waste for brick making have been made by the United States Bureau of Standards. The material lacks plasticity, and the only process by which it can be shaped into bricks is by dry pressing. It was found that the weathered top material makes much better bricks than the waste from fresh slate, because a large part of the lime and other fluxes have been leached from the former. This has also been found true at Rockmart, where the fresh slate will not make a vitrified brick strong enough to use in street paving.

Government Doings of Interest to Rock Products Operators

Many Questions of Importance to the Industry to Come Before Congress—Rail Investigation Next Month—Tax Reports to Be Re-audited

By Bertram F. Linz, Washington, D. C., Bureau of Rock Products

MANY PROBLEMS OF IMPORTANCE to the rock products industry are now before the Federal Government for solution. Chief among these, of course, is the highway question, which has been the subject of several conferences between the President and delegations from all parts of the country, and which was referred to by President Harding in his message to Congress on April 12. Tax matters also affect the industry, and the revision of the tariff will bring up the questions of duty on various classes of stone, etc.

The bills which have thus far been introduced in Congress to deal with the highway question are discussed elsewhere. No steps have been taken as yet, however, to formulate legislation in line with the President's recommendation that Federal aid for road building be withheld from states which fail to maintain properly the roads so built and to require that the states desiring Federal assistance in the construction of their highways furnish proper assurances that any roads built will be kept in good condition.

A thorough revision of the tax system is sought by Congressman Fess of Ohio, who has introduced a resolution in the House to provide for a commission to inquire into the present system and make recommendations for revision of the revenue law. Leaders in Congress have been flooded with advice as to how the law should be corrected, the only trouble being that most of this advice would tax

the other fellow, but would not touch the advisor. What is needed, it is pointed out, is tax revision that would tax all equally, and which, if any taxes were lifted, would benefit all as well.

Under the terms of the Fess resolution, the President would appoint a commission consisting of 11 members; three from the Senate, three from the House of Representatives and five to be selected outside of Congress. The duty of the commission would be to consider the subject of taxation and report its findings and recommendations not later than July 1 in order that the study might be used as a basis for revision of the revenue bill which is to be undertaken in the near future.

Repeal of the transportation taxes in Section 500 of the revenue act is sought by Representative Green of Iowa, ranking Republican member of the House Committee on Ways and Means, in a bill which he has just introduced. This section provides for the tax on freight and passenger transportation, long distance telephone message, telegraph messages, etc.

The amendment of the Constitution so as to give Congress the power to regulate child labor is sought in resolutions now pending in the House. Representative Mason, of Illinois, would give Congress the power to prohibit or regulate the employment of children under 16 years of age in one resolution, and in another would provide a tax of \$2 per

day to be levied upon employers permitting persons under 14 years of age to work in any mill, workshop, factory or manufacturing establishment, or permitting persons under 16 to work in any mine or quarry. A resolution introduced by Congressman Rogers of Massachusetts would give Congress the power to regulate the employment of women and persons under the age of 21 years.

The relief of taxpayers sustaining business losses in subsequent years is provided for in a bill prepared by Representative Burroughs, of New Hampshire. This bill provides that if for any taxable year beginning after October 31, 1918, it appears upon the production of evidence satisfactory to the commissioner of internal revenue that any taxpayer has sustained a net loss, the amount of such net loss shall be deducted from the net income of the taxpayer for the preceding taxable year, and the taxes imposed for the preceding taxable year shall be re-determined accordingly.

The general railroad investigation contemplated by the Senate Interstate Commerce Committee, through which Senator Cummins, chairman of the committee, hopes to develop what is the matter with the railroad and transportation system, will begin shortly after May 1, it has been announced. It is planned first to hear the statements of the railroad executives, to follow this by statements from the representatives of labor and to close the hearing after receiving the complaints and suggestions of the shippers.

Prominent shippers from all sections of the country have recently been in Washington to make plans for their part in the hearings. It is understood to be their position that the country is unable to pay the total that is being required of it under the existing rate schedules. It is recognized that the working conditions must be adjusted and that rates will have to be fixed on the basis of a reasonable level before the country will be able to get back to anything like normal in respect to transportation.

Manufacture of Keene's Cement

Now Produced on Large Scale by Use of Rotary Kilns

KEENE'S CEMENT is a gypsum plaster material of English origin. The original method of manufacture was to burn the gypsum at a low temperature to convert it into the hydrate ($2\text{CaSO}_4 \cdot \text{H}_2\text{O}$). The lumps of partially calcined gypsum were then soaked in a solution of alum, aluminum sulphate, or borax, and recalined at a temperature of about 500 deg. C (932 deg. F.). This material ground was the original Keene's cement.

American-made Keene's cement has been produced at Medicine Lodge, Kan., and other places in this country for a number of years. This material sets harder than ordinary gypsum plaster and sells at higher prices. It is used in wall plasters, for making imitation marble, as a backing for marble slabs and for ornamental plaster work. A very large possible use for it is in lime stuccos and plaster, as described in *ROCK PRODUCTS*, April 7, 1921, pages 19-27.

Recent Improvements in Manufacture

Methods of manufacture of Keene's cement have always been trade secrets, until recently, when the rotary kiln was adopted for burning it. Two recent patents covering the use of rotary kilns for this purpose give in some detail the manufacturing process. All these patents are owned by the Best Brothers Keene's Cement Co., Medicine Lodge, Kan.

One of these patents, issued to John C. Best in 1919, states:

"The market product known as the superfine grade of Keene's cement and generally used for the manufacture of artificial marble or scagliola has heretofore been produced in the following manner:

"A standard grade of Keene's cement is mixed with water, permitted to set, being at that time molded into blocks of suitable size, these blocks are then recalined substantially as was the original gypsum. After this second calcination the blocks are crushed and ground to produce the superfine product.

"I have discovered that this same product may be more simply and cheaply prepared by initially burning the gypsum at a temperature higher than would ordinarily be employed for the production of a standard grade of Keene's cement. I prefer to carry out this burning or calcining operation in a rotary internally-fired kiln of the type used in the portland cement industries, conducting the process so as to obtain a temperature of 1200 to 1400 deg. F. of the burnt product issuing

from the nose-ring of the kiln. The time of passage of the material through the kiln under these temperature conditions should be approximately one hour.

"As an accelerator, catalyst or setting agent for this material I employ a neutral salt, such as neutral potassium sulphate, in the proportion of 1 per cent by weight. The entire product should be ground to 150 mesh.

"This product prepared in this manner is very slow setting, has no effect upon colors, takes a very high polish, and is perfectly suited for the uses to which the superfine grade of Keene's cement is put, that is particularly for artificial marble or scagliola."

Use of Rotary Kilns

A patent issued on March 8, 1921, to William Hoskins and assigned to the Best Brothers Keene's Cement Co. describes the rotary kiln process in detail as follows:

"The plant illustrated by the diagrammatical sketch receives the gypsum in the form in which the latter is quarried, that is, in lumps of a weight up to perhaps 100 pounds, crushes and grinds the gypsum, burns the latter to effect the predetermined dehydration, and cools the burnt product. The subsequent stages of manufacture, i.e., the final grinding and admixture with the set accelerator or catalyst, is accomplished by the known types of machinery not illustrated.

"The quarried gypsum enters the plant at the jaw-crusher designated 1 in the drawing, in which it is preliminarily crushed, then delivered by the conveyor 2 to a rotary mill 3, in which it is ground to a relatively fine state of subdivision, for example, until 60 per cent of it will pass a 60-mesh screen, the remainder being not larger than $\frac{1}{4}$ -mesh.

"From the mill 3 the ground gypsum is delivered by an elevating conveyor 4 to a pair of gravity feed-hoppers 5. From the bottoms of the hoppers 5 the ground gypsum is fed by regulating conveyors 6 to feed-spouts 7, through which it discharges by gravity into the upper ends of the two rotary kilns 8, these kilns being of the usual form heretofore commonly employed in the portland cement industries.

"The kilns 8 are internally fired, as by oil burners, at their lower ends, this construction being well understood and not illustrated. At the nose-rings of the kilns the product spills into the chamber 9, from which it is continuously removed by

the chain-conveyor 10, and thence delivered to a third rotary cooling kiln 11, preferably mounted outside the building which houses the remainder of the plant, as is illustrated in the drawing. The cooling kiln 11 is likewise of the ordinary kiln construction, the hot material being received in the inlet end thereof and passing slowly through the same to the outlet end, being subjected throughout its course to a natural draft of air entering at the outlet end of the kiln and escaping through a stack 12 connected with the chamber at the inlet end of the kiln.

Steam-Vaporized Oil

"The steam-boiler 13 supplying an engine 14 provides power by which the plant machinery is operated through the connections shown. The fuel-supply tank 14 is illustrated as located outside of the building, supplying fuel to a pump 15 which provides the pressure for feeding the same to the burners, the oil and steam delivery lines being designated 16, 17, respectively.

"Air is delivered to the burners through the air flues 18 and the combustion gases are led from the inlet ends of the kilns to the stacks 19 in the usual way. In the plant diagrammatically illustrated by the drawing the kilns are each 60 ft. in length, 5 ft. in internal diameter, are driven at a speed of 0.75 revolutions per minute (45 revolutions per hour), and pitched at $\frac{3}{8}$ in. to 1 ft., this construction and method of operation giving a time interval of 55 minutes in which any given batch of gypsum passes through the kiln.

Process in Detail

"The apparatus described above is operated in the following manner: The quarried gypsum, preliminarily crushed in the jaw-crusher 1, and subsequently reduced to the indicated state of fineness in the mill 3, is delivered to the hoppers 5 from which it feeds, by gravity, to the regulating conveyors 6. The drive of these conveyors is so adjusted as to deliver the finely divided gypsum to the kilns at a predetermined and uniform rate. I have found it to be particularly necessary to carefully control this feeding operation, since if the feed is seriously slackened or interrupted for any considerable period of time, I find that the temperatures within the kilns rapidly rise, over-burning the product and rendering it useless. It should therefore be noted as particularly important that the feed to the kilns must be uniformly main-

tained at the predetermined rate, this rate being fixed by the size, rate of firing and speed of the kiln, as will later appear.

Burning

"The continuous stream of gypsum in the state of subdivision described enters the upper ends of the kilns 8, building up and maintaining a bed of gypsum on the bottom of each kiln, the material in the bed moving continuously downward toward the lower end of the kiln until it finally spills over the nose rings. In its passage through the kiln, the bed of relatively finely divided gypsum continuously exposes fresh surfaces to the wall of the kiln and to the atmosphere of highly heated combustion gases therein. I have found that with the material in the state of subdivision mentioned the degree of dehydration required for the production of a Keene cement stock of standard grade is effected by firing the kiln in such manner as to maintain a temperature of from 850 to 1500° F., this being the temperature of the gypsum bed itself at the nose-rings of the kiln, where the time of passage of the material through the kiln ranges from one-half to two hours, the shorter time of passing requiring the higher temperature, and, conversely, the longer time of passing permitting the lower temperature.

"In the installation illustrated by the drawing, I find that the best results for the production of the standard grade of Keene cement are attained by maintaining an average temperature of approximately 1100°, the time of passage through the kiln being 55 minutes, and the rate of feed for each kiln $2\frac{1}{2}$ to $2\frac{3}{4}$ tons per hour. If the feed be increased substantially, other conditions remaining the same, it will be found that the temperature of the gypsum bed will drop, giving an underburnt product, while, conversely, if the feed is reduced or interrupted the product is overburnt.

Cooling

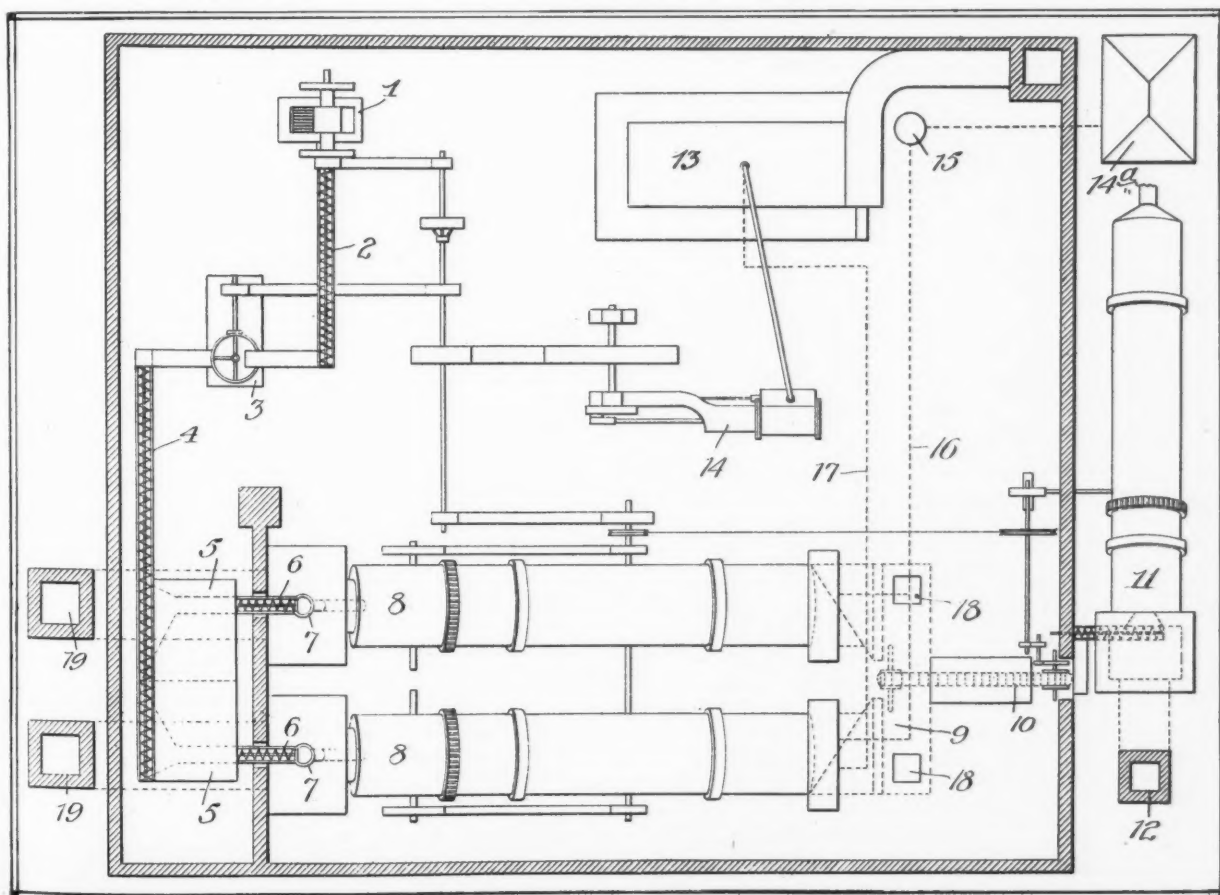
"The continuous stream of burnt gypsum spilling over the nose-rings of the two kilns 8, being at that time at a temperature of approximately 1100°, is conveyed to the rotary cooling kiln 11 by the mechanism described, and in traversing the latter becomes reduced to a moderate temperature so that it may be handled without special precautions. It may be noted with respect to the cooler 11 that it is desirable to check or baffle the air current therein in order that the dust loss may not be excessive, the continued agitation of the product in the burning kiln and in the cooling kiln reducing a large portion of it to a degree of fineness which necessitates guarding against

dust losses. The cooled product delivered from the lower end of the cooler 11 is conveyed in any appropriate manner to a mill, in which it is reduced to the desired degree of fineness for the market, and simultaneously or subsequently admixed with the proper proportion of potash-alum, or other setting agent, all in the usual manner, except in so far as the precautions to be hereinafter mentioned are to be observed.

Peculiarities of Rotary Kiln Cement

I have discovered that the operation of calcining gypsum to the extent required for the production of Keene cement, as carried out by direct firing in a rotary kiln produces a product which has peculiarities distinguishing it most markedly from the burnt gypsum heretofore used for the manufacture of Keene cement and produced entirely, as far as I am aware, by prolonged firing in stationary kilns and while in the form of relatively large aggregates.

"The distinguishing peculiarity of the product produced in accordance with my method is the change in the character of the lime content by the rotary kiln calcining operation. Whereas a certain quality of gypsum burned in the customary manner in stationary kilns, later ground, mixed with potash-alum, and set, produced a highly satisfactory cement of good tensile strength,



Diagrammatic plan showing the new method of manufacture of Keene's cement

density and appearance, this same quality of gypsum when burned with the utmost care by my rotary kiln method, and apparently dehydrated to an identical chemical condition, being admixed with the same setting agent and set in the same manner, gave a final product which had swelled very greatly in the mold, was deficient in tensile strength and density and markedly porous.

"These same results varying only in degree may be expected with any natural gypsum now known to be available in the United States. This puffiness, porosity, or swelling of the cement produced by direct firing at high temperatures for a relatively short interval of time of finely divided gypsum, in accordance with my process, I find to be due not to the gypsum itself, but to the change in character of the calcium carbonate content thereof brought about by the method of manufacture described. I find that this difficulty may be entirely corrected by three methods, as follows:

Overcoming Difficulties Caused by Calcium Carbonate Content

"1. By the addition to the burnt product of a quantity of hydrate of lime, for example, 0.2 to 0.5%, although any proportion greater than this may be used.

"2. By the use of a setting agent more strongly acid than the potash-alum which is commonly employed, for example, by the use of potash sulfate, containing 0.25 free acid.

"3. By grinding the burnt product to an unusually fine state of subdivision, for example, 150-mesh.

"Based upon the foregoing, it is my conclusion that in the calcining of the gypsum in the manner described, the lime content thereof suffers a peculiar modification, which I assume to be surface calcination, perhaps accompanied by surface sintering, fluxing, or fusing, these results being explainable by reason of the very high flame temperature in the kiln and the opportunity which is necessarily given for overburning of the surfaces of the particles.

"It is my belief that by reason of this surface modification of the lime content of the burnt product, the acid constituent of the setting agent, as for example, potash-alum, re-acts with the calcium compounds much more slowly than would normally be the case, so that the reaction is still incomplete and carbon-dioxid is still being liberated when the material has set so far as to prevent its escape. By virtue of this continuing reaction during the period of setting, the cement is therefore caused to puff and become porous. As before stated, this difficulty may be entirely overcome by speeding up the reaction of the acid constituent of the setting agent with the lime content of the cement, which acceleration may be accomplished in any one of the three ways mentioned. The action being properly accelerated, the evolution of carbon dioxid ceases while the cement remains so

nearly fluid as to permit the free escape of the liberated gas.

"By the process described I am therefore able to produce from gypsum a dehydrated product suitable for use in the production of Keene's cement by a rotary kiln calcining method, which is highly desirable from an economic standpoint and superior to the stationary kiln method heretofore required. While by the practice of my process certain difficultly explainable variations in product as compared with the product made by the process heretofore employed, resulted, which variations would appear *prima facie* to negative the utility of my process, I have found that the difficulties met with are not due to any basic or irremediable fault in the process of the product, but are, on the other hand, caused by a trifling change in the character of an impurity, the results of which may be entirely offset by the corrective measures indicated.

Revolutionary Improvement

"In view of the past and existing state of relative stagnation of the art of producing Keene's cement, and the prevailing opinion of those best skilled in the art, based upon costly and unsuccessful efforts, that it would be impossible to produce a satisfactory product without adhering substantially to the known methods, I have in the foregoing set forth in considerable detail the exact procedure and apparatus which I employ in the practice of my invention, together with the results of variations from this procedure and the theories which I entertain with respect to the peculiarities of my process. It will be understood, however, that all of this matter is only for the purpose of making my invention more readily understood, and I do not regard the invention as limited to the exact procedure or apparatus described, nor as dependent upon the soundness or accuracy of these theories, except in so far as such limitations are included within the terms of the accompanying claims, in which it is my intention to claim all novelty inherent in my invention as broadly as is permissible in view of the prior art.

"What I claim is:

"1. The method of producing Keene's cement stock which consists in reducing gypsum to a state of subdivision such that the largest particles shall not substantially exceed one-quarter mesh, continuously introducing the product at a uniform rate into a rotary kiln, operating the kiln to cause the gypsum to progress through the same in a period of not less than one-half hour and firing the kiln internally to maintain a temperature of not more than 1500° F. and not less than 800° F. in the outgoing burnt gypsum, the higher temperature being employed in conjunction with the shorter time of burning.

"2. The method of producing Keene's cement stock which consists in reducing gypsum to a state of subdivision such that the largest particles shall not substantially exceed one-quarter inch mesh, continuously introducing the finely divided product at a

uniform rate into a rotary kiln, operating the kiln to cause the gypsum to progress through the same in a period of substantially one hour, and firing the kiln internally to obtain a temperature of approximately 1100° F. in the outgoing burnt gypsum.

"3. The method of producing Keene's cement stock which consists in reducing gypsum to a relatively fine state of subdivision, continuously passing the finely divided product at a uniform rate through a rotary internally-fired kiln, and treating the burnt product to insure completion of the carbon-dioxid liberating reaction before loss of fluidity of the setting cement.

"4. The method of producing Keene's cement stock which consists in reducing gypsum to a relatively fine state of subdivision, passing the subdivided product continuously at a uniform rate through a rotary internally-fired kiln, and adding hydrate of lime to the burnt product in amount sufficient to neutralize all acidity.

"5. The method of producing Keene's cement stock which consists in reducing gypsum to a relatively fine state of subdivision continuously passing the finely divided product at a uniform rate through a rotary internally-fired kiln, and adding an acid substance to the burnt product in amount sufficient to insure completion of the carbon dioxid liberating reaction before loss of fluidity of the setting cement.

"6. The method of producing Keene's cement stock which consists in reducing gypsum to a relatively fine state of subdivision, continuously passing the finely divided product at a uniform rate through a rotary internally-fired kiln, and grinding the burnt product to at least 150 mesh."

Calcareous Marl Produced in 1920

REPORTS MADE to the United States Geological Survey, Department of the Interior, show that 97,487 short tons of calcareous marl, valued at \$322,329, was produced in the United States in 1920. These figures represent an increase of 6.6 per cent (6,050 short tons) over the quantity produced in 1919, but a decrease of 1.5 per cent (\$4,955) in the total value of the product. The average price per short ton was \$3.31 in 1920 and \$3.58 in 1919.

Most of the marl sold in 1920 was used in agriculture, in the same manner as pulverized limestone and agricultural lime, but some was used as a filler in patent fertilizer. In Arkansas, where the product included chalk, a small quantity was sold as whiting, which brought a much higher price than the agricultural material.

Nearly one-half of the total output—42,510 short tons—was produced in Virginia and was valued at \$143,373. The other producing states were Arkansas, California, New York, North Carolina, Ohio, South Carolina and West Virginia.

Improvements in Tube Mills*

Closed Circuit Grinding and Air Separation Have Increased Grinding Capacity of Tube Mills 15 to 25 Per Cent

CEMENT AND METAL-MINING

OPERATORS have run the gamut in fine-grinding equipment, beginning, let us say, with buhr-stones in the cement industry and the arrastre in the metal-mining industry and passing almost completely through the ring-roll type of grinder to the ball-tube mill of the present day. The mining industry may be said to have passed completely through the ring-roll period while the cement industry still has some spots where the ring-roll type is considerably used; the Lehigh cement district in Pennsylvania is an example of this, though in general the cement industry has also moved into the tube-mill age.

There is a striking difference between the practice in the mining industry and the cement industry. Most of the American cement operators use the dry process while the mining operators generally grind wet. The wet grinding is now usually done in short ball-mills, while the dry grinding in the cement plants is done in tube-mills, 22 to 26 ft. in length; even longer tube-mills are being used abroad. The cement industry was first in the utilization of the tube-mill, but owing to the limitations of dry grinding as generally practiced in American cement works there have been greater changes in the wet grinding practice as developed by the mining operators.

The Short Ball-Mill

It may be well to review briefly the developments that have taken place in the use of the tube-mill in the mining industry. When first introduced, it was used in its long form as commonly employed in the cement plants, pebbles being the grinding medium. One of the objections in metallurgy to this long mill was the excessive production of slimes. At this time a shorter form of tube-mill, generally referred to as a ball-mill, was also used, but principally as a coarse crusher. These two mills were almost identical in construction and grinding principle, but the ball-mill took its name from the fact that steel balls were used as the grinding medium and the longer tube-mill was similarly designated as a pebble or tube-mill. The difference between the ball-mills and the tube-mills, originally a mere difference in length and grinding medium, has disappeared so that these two names are now practically synonymous.

*Based on a discussion of "Pulverizing Anthracite" in the February issue of the "Journal of the Engineers' Club," of Philadelphia, Penn.

By Richard H. Vail,
New York City

The World War cut off the supply of Danish flint pebbles with the result that most of all the tube-mills, operating with pebbles at the time the war started, became ball-mills by the substitution of steel or chilled iron balls for the pebbles. This proved to be a "blessing," as the tonnage of these mills was greatly increased.

Closed Circuit Grinding

In the western metallurgical field, important improvement was made in wet grinding by reducing the length of the tube-mills and operating in what is known as "closed circuit"; that is, overfeeding the mill and letting it discharge before all the material has been reduced to the required fineness; the product is then classified and the material, which is too coarse, is returned to the mill. This closed-circuit grinding gave much more 200-mesh material for the horsepower expended than when the attempt was made to grind all the material to this mesh before discharging. One of the prime reasons for these results is the inability of the ball-tube mill to segregate and discharge its products as quickly as made. Taking the material out of the mill and removing the fines and returning the coarse helps to solve this trouble. The marked result has been that in the mining industry, most of the tube-mills recently installed are shorter and they are now generally referred to as ball-mills and are generally operated in closed circuit when fine grinding is desired.

Dry Grinding in Closed Circuit

In the cement industry, on the other hand, closed-circuit grinding has not been carried so far as in the metal-mining industry and the tube-mills have remained in their original length or have been made longer in order to secure the super-fineness so desirable in good cement. While their specifications usually require from 82 to 85 per cent through 200-mesh, the cement manufacturers really aim to get considerable 350-mesh material and would like to have appreciable amounts of 1,000-mesh material.

The closed-circuit grinding that has been applied to a limited extent in the dry-grinding cement plants has resulted in an increase of 15 to 25 per cent in the output of their tube-mills; this is accom-

plished by discharging the material before it is completely ground and classifying it in a separator of the Pfeiffer or Emerick type and returning the oversize to the tube-mill. The difficulty of discharging its finished product was long a drawback of the tube-mill. Closed-circuit grinding may be characterized as a "device" to get the finished product out of the mill more quickly.

Air Separation Applied to Tube-Mills

The more direct air separation of the finished particles, so long practiced in bituminous coal mills of the ring-roll type, has lately been applied to tube-mills and promises to be as great an advance for some branches of dry grinding as was the substitution of steel balls for the old flint pebbles. Air separation has the following advantages over closed-circuit grinding: It avoids returning to the mill the large circulating load and it removes more quickly the finished particles.

The tube-mill equipped with direct air separation offers no principle that has not been proved in older practices and should add to the increased efficiency obtained under the closed-circuit system of dry grinding with the tube-mill and Emerick separator.

The simplicity of the tube-mill, the facile replenishment of the grinding medium and the continuity of its operation are the reasons which I think will cause its general adoption for the pulverizing of anthracite, just as these factors determined its adoption by the two greatest industries grinding abrasive materials.

Tube-Mill Feed

The general practice with mills of the tube type is to feed pieces ranging from about 20-mesh to 3½-in. in size. Acceptable feeds for tube-mills may be said to range between 20-mesh or finer up to 1½-in.; though pieces up to 3½-in. or even larger may be pulverized in the tubes it is more economical to reduce these in other forms of apparatus unless they represent only the occasional piece when simplicity of installation may dictate the use of a double-compartment tube-mill. Experience has shown that down to certain limits rock can be more economically reduced in crushers or breakers than in any other apparatus. In the later western plants it is the practice to reduce the rock to ¼ on ¾-in. in rock breakers of some type, and to complete the pulverization in the fine grinders—work for which such apparatus is best adapted.

Use of Silica and Other Mineral Fillers in Paints

V—Special Uses of Mineral Inerts—Barytes in Zinc Paints—Extensive Field for Mineral Extenders

HAVING ILLUSTRATED how inerts may be used rationally in some cases and not in others, there remain those interesting special cases where some one of the inerts is of specific value when used in conjunction with some particular opaque pigment. In continental Europe straight zinc oxide has long been extensively used in exterior painting; in some countries even to the exclusion by law of white lead altogether. In America the situation is practically reversed, much straight white lead being used and little or no straight zinc. Under these circumstances it seems a little peculiar that of the millions of gallons of ready-mixed paints used practically none of them is made either of straight lead or of straight zinc.

There are several contributing causes for this which we cannot discuss here, but in the case of zinc there are certain reasons which demand our attention, viz.: it is extremely fine with a very large specific surface thus taking a large volume of oil to wet it, and with linseed oil has a tendency to yield "short" paints, i. e., having a consistency more like butter and less like molasses. To carry zinc to average brushing consistency requires so much oil that the paint has an abnormal spreading rate; the volume of pigment on unit area becomes very small, giving little hiding power. Because of all this, authorities more or less competent have frequently stated that "zinc has no body" (meaning hiding power), or words to that effect, but we shall see that any such statement is not really true.

The refractive index, which is the measure of opacity in white pigments, is practically the same for both white lead and zinc. The specific gravity of zinc is about 5.6 and that of white lead is about 6.7. Remembering that paints are applied by volume; that pigment volumes are inversely proportional to the specific gravity; and, that hiding power is proportional to the volume of pigment on unit area, it follows directly that if 5.6 lbs. of zinc are spread uniformly over the same area as 6.7 lbs. of lead, the hiding or opacity of the coat will be the same. The practical difficulty is to get that amount of zinc onto that area in the form of good paint. This brings us to the point of the case in hand.

Barytes in Zinc Paint

If zinc be ground in good linseed oil to about as stiff a paste as can be handled

By F. P. Ingalls
Chemist, John W. Masury & Son, Manufacturers of Paints and Varnishes, Brooklyn, N. Y.

readily in the mill, the proportions will be about 83 per cent and 17 per cent oil. No more zinc can be added without making the paste unduly stiff, but to 100 lbs. of such paste as much as 60 lbs. of fine barytes may be added and instead of becoming stiff as putty, as might be expected, the paste becomes even thinner than before, apparently, is not so short, and will thin down to good brushing consistency with less oil than the original paste. When carefully made such paint compares favorably with any other, both in hiding power and durability, and is especially useful in localities where deleterious substances in the air cause paints made wholly or largely from lead to darken seriously. At normal prices for the materials this paint can be sold at a lower figure than straight lead-and-zinc paint, with full economy to the consumer.

There are a few other instances where the inert seems to have a sort of corrective influence on the color pigment, and modern Physical Chemistry offers explanations more or less satisfactory, but as yet not very much is known about the surface energy relations between pigment and vehicle in solid-liquid systems of this kind. (Compare Wm. D. Harkins et al., Jour. Am. Chem. Soc., Dec., 1920.)

Mineral Inerts with Coal-Tar Colors and Organic Pigments

Finally there is another way in which white inerts may enter into paints, sometimes in large proportion. Many of the pigments available to the manufacturer of paints consist of certain organic natural coloring matters and numerous coal-tar dyes precipitated on a base, or carrier, of variable composition which may contain one or more of the inerts already mentioned. Such colors are known as "lakes," but there are also a few coal-tar colors which are really organic pigments, containing no inorganic matter whatever; these latter are the so-called "toners" and are used in the same way as chrome green, chrome yellow, iron oxide, or any other pigment, and do not be-

come lakes by being reduced with inerts merely mixed with them.

A large majority of the lakes available for paint-making are some shade of red, in fact, with the exception of English Vermilion, American Vermilion (crystalline basic Lead Chromate), and a few pigments which owe their color to iron oxide, nearly all the red paints contain organic coloring matter and consequently the inert base which serves to carry it. Certain mixed colors also, as for instance Tuscan Red which is merely an iron oxide toned up with red lake, may be expected to contain inert not primarily introduced to reduce superfluous opacity and cost.

In general these lakes are not very opaque and will stand little or no reduction in addition to the inert they already carry, but some of the organic pigments, such as paranitranilin red for instance, will stand almost as much as iron oxide. Many of the cheaper "agricultural reds" carry as little as five per cent of "para" red to 95 per cent of whiting, and in some extreme instances coming under the writer's notice, the proportion has fallen as low as 3.6 per cent. With "para" red at specific gravity of 1.50 and whiting at 2.60 the last case shows a volume reduction of about 15 volumes of inert to 1 volume of color, and in the case of iron oxide an equivalent reduction would call for about 11.25 per cent of oxide to 88.25 per cent of whiting, a degree of reduction which, in the case of para red at least, has probably passed the really economical limit except possibly for some very special kinds of work.

Very Extensive Field for Rational Use of Mineral Extenders

The foregoing illustrative examples show that there is an extensive field for the rational use of inerts in the paint industry, but before proceeding to our summary it is desirable to qualify some of our preceding statements both for the sake of accuracy and to avoid certain kinds of criticism which otherwise might be well founded. We have allowed it to be inferred for instance that these inerts have practically no opacity or hiding power in the paint coat; this is not strictly true, since all of them show a higher refractive index, somewhat, than any of the usual vehicles, and consequently are not transparent in such vehicles. All the inerts then have some hid-

ing power and it is not always wholly negligible.

We have also stated that the hiding power depends on the volume of opaque pigment on unit area; this is quite true so far as it goes, but the inert contributes something, and the general result is also modified by the fineness of the pigment as well as by mere thickness of coat; it should be noted too, in spite of its obviousness, that after enough pigment has been spread over unit area to give complete hiding, any further quantity cannot make the hiding any more complete, therefore the original statement assumes as self evident that the minimum volume necessary to secure complete hiding is the critical measuring point. Further, in our treatment we have not differentiated between the individual inerts, and, with the exception of barytes, have regarded them as being almost interchangeable except as to cost. This is not rigidly exact. A careful study of the finished paints leads to the conviction that it is not altogether a matter of indifference which one or ones are selected for use in a given case, but to carry this matter into its finer detail requires a scientific knowledge of the subject that has not been recognized, even by the leading manufacturers, until very recent years.

(To be continued)

Saratoga Sand and Gravel Co. Plant in California

SIR—We have noted on page 32 of your issue of February 26, 1931, that there is a short description of the operations at the plant of the Saratoga Sand and Gravel Co., at Saratoga, Calif., and also some excellent views of this plant. The writer had occasion to visit this plant in California several years ago, and can therefore appreciate the pictures very much. At that time the property was called the Quality Sand and Rock Co.

In one of your paragraphs you state that: "The dirty wash water instead of being allowed to run to waste is flumed to a Dorr classifier, which is a special type of agitated settling tank," etc. We believe that this might possibly be misleading to some of your readers, because the machine used is really a Dorr "thickener", and not a "classifier." The Dorr company manufactures classifiers, but they are for an entirely different purpose; because the classifier is used for washing gravel, and is an improvement over the log washer.

The thickener, however, which is used at Saratoga is for the purpose of settling the dirty wash water, as your article states. The thickener is a mechanically operated, continuous settling tank. At this particular plant the tank is made of wood, and is, as I remember, 34 ft. in diameter by 10 ft. deep. The mechanism in the

tank consists of a vertical shaft having at its bottom arms and scrapers which slowly revolve and remove the settled solids to the center of the tank. Clear water continuously overflows the top of the tank and goes to the collecting pond that you mention, as very clearly shown in the picture at the bottom of page 33.

Settled solids containing about 50 per cent moisture are continuously removed from the bottom of the tank by a pipe and impounded. The vertical shaft is driven by a worm gear and worm at a very slow speed. The cost of operation, for repair, and for the labor in supervising, is practically nothing.

We have written you at length on this subject because it is one that many of your readers are greatly interested in, because this problem of preventing the return of waste solids to streams is one that is being very much discussed throughout the country. An installation similar in principle to the one that you have described is also in operation at the plant of the Engels Copper Co. in the Sierra Nevada Mountains. In this case the Dorr thickener which is used is 80 ft. in diameter by 14 ft. deep, being a great deal larger than the one at Saratoga, but the purpose is exactly the same. The water obtained at Engels, however, is put back into the stream, because it is absolutely free of suspended matter, and just as clear as the stream itself.

At the time of the writer's visit to Saratoga, this tank had been operating for several years, and the results being obtained were excellent. The stream referred to in your article is perfectly clear and full of fish; but except for the installation described would be ruined as far as its beauty is concerned, and at high water the farm lands would be greatly handicapped by depositions of sediment.

THE DORR COMPANY, INC.,

By G. W. Repetti.

New York City, April 15, 1921.

The Magnesite Industry in 1920

THE PRODUCTION of magnesite in the United States in 1920 increased 94 per cent in quantity over that of 1919. The entire output was made by two states, California and Washington. California mined 63 per cent more magnesite in 1920 than in 1919 and more than eight times as much as it mined seven years ago. Washington increased its production 109 per cent over that of the preceding year, making by far the largest output it has yet made. According to the United States Geological Survey, Department of the Interior, the total production of magnesite in the United States in 1920 was 303,767 short tons, which was valued at approximately \$2,748,150.

Most of the output of California was calcined and used as plastic material, only a small part being natural ferromagnesite used as a refractory lining of steel furnaces on the Pacific Coast. On the other hand, practically all the magnesite mined in Washington was dead-burned into synthetic ferromagnesite and used as a refractory lining of furnaces and smelters.

The largest producers in California were the Tulare Mining Co. and the Sierra Magnesite Co., at Porterville; the White Rock mine, operated by Frank R. Sweasy, in Napa County, and the property of the Western Materials Development Co., on Red Mountain, operated by C. S. Malthy.

The Northwest Magnesite Co., of Chewelah, Wash., was the largest producer in the United States. It shipped in 1920 more than 90,000 tons of dead-burned ferromagnesite, most of which was sent to steel companies and manufacturers of refractory products east of the Mississippi. The American Mineral Production Co., of Valley, Wash., sold its output crude to the Northwest Magnesite Co., whose quarries are nearby. The Western Materials Co. operated the Double Eagle magnesite mine, near Valley, and shipped the calcined product to the American Refractories Co.

At the end of December, 1920, all the operations in Washington were stopped, principally, it is believed, on account of a lack of orders from the steel companies, many of which were idle or were not working full time. Some of the California producers were considerably discouraged at the end of the year on account of the high cost of labor and supplies, the high freight rates, and the competition of foreign material.

Imports

The imports of magnesite in 1920, reported by the Bureau of Foreign and Domestic Commerce as calcined, not purified, amounted to 43,154 long tons, valued at \$780,078.

The magnesite imported from Italy was mined in Austria, and that from Czechoslovakia was obtained from the former Hungarian deposits. That imported from Mexico came from Santa Margarita Island was calcined near San Diego, Calif. A shipment from Greece received in November was the first one sent from that country since 1916. The arrival of 2,300 tons from Venezuela in September, 1920, was a notable event, as the recorded imports of magnesite from that country are meager.

Although the quantity of magnesite imported in 1920 was nearly three times as great as in 1919, it was only about one-seventh of the quantity commonly imported before the War.

Practical Chemistry for Lime and Cement Manufacturers

General Properties of the Metals—Metallic Lustre—Physical Properties—Alloys

WE NOW COME to the subject of the metallic elements, and before taking up these in order, it may be well to generalize somewhat on the properties of this important group of elements. For the most part, the preparation and use of the metals and their mixtures (called alloys) represent the ingenuity of man. Since only a few of them actually occur in nature, they must, almost all of them, be reduced from their ores by a chemical process.

The advance of civilization may be said to have gone hand in hand with progress in the art of making metals. First came the savage whose implements were of stone, then the savage found out how to make copper and a little farther on how to mix it with tin and make a harder alloy, bronze. With each step civilization advanced until with the latter epoch we have the civilization of the Aztec and the Egyptian. Then came the discovery of iron and a further advance to the civilization of Rome and Greece. Little advance was then made until the discovery of steel when the steamboat and the railroad came, finally today with the manufacture of aluminum, and a dozen or more steel hardening metals, we have the aeroplane and the automobile.

Metallic Lustre

The most evident property of the metals is what is commonly called metallic lustre or the metallic appearance common to sheets of bright gold, silver, nickel, etc. In the form of a powder, metals do not show this lustre, but when in the form of compact masses such as lumps, bars, sheets or utensils, they always show this lustre and are usually white in color, gold which is yellow and copper which is red being the only exceptions. One metal, mercury is a liquid but none are gases at ordinary temperatures.

Physical Properties of the Metals

The metals vary in specific gravity or density from lithium which is the lightest, to osmium which is the heaviest. Lithium is only half as heavy as water, while osmium is more than twenty-two times as heavy. The relative density of the common metals is shown below:

RELATIVE DENSITY OF THE METALS	
Lithium	0.59
Water	1
Magnesium	1.74
Aluminum	2.56
Chromium	6.50
Antimony	6.71
Zinc	7.14
Tin	7.29
Manganese	7.47
Iron	7.86
Nickel	8.70
Copper	8.69
Bismuth	9.75
Silver	10.53
Lead	11.37
Gold	19.26
Platinum	21.50
Iridium	22.42
Osmium	22.48

By Richard K. Meade, M. S.

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Most metals are malleable and can be beaten into thin sheets. Those which are allied to the non-metals such as arsenic, antimony and bismuth are brittle and can be reduced to a powder in a mortar. Gold is the most malleable metal and it is possible to make from it sheets the thickness of which are not more than one ten millionth, of an inch (0.0000001 inch). Zinc becomes malleable only when heated to 150° C. The relative malleability of the metals is shown in the table below:

RELATIVE MALLEABILITY OF THE METALS

1. Gold	6. Platinum
2. Aluminum	7. Lead
3. Silver	8. Zinc
4. Copper	9. Iron
5. Tin	10. Nickel

The tenacity or tensile strength of the metals vary greatly. Iron stands at the head of the list of common elements with zinc and lead at the bottom. The tenacity is measured by the number of pounds which a bar of metal one square inch in cross section can sustain without breaking.

The hardness of the metals also varies between wide limits. Potassium is as soft as cheese while chromium is so hard it scratches or cuts glass.

RELATIVE HARDNESS OF THE METALS

1. Manganese	7. Silver
2. Nickel	8. Gold
3. Iron	9. Aluminum
4. Copper	10. Magnesium
5. Platinum	11. Tin
6. Zinc	12. Lead

The metals are fusible and volatile. Mercury fuses or melts at -40° F., and hence is a liquid at ordinary temperatures, and boils at 675° F. Potassium and Sodium melt below the boiling point of water and boil at about 1300° F. Of the common metals used as such in the arts, tin is the most easily melted and chromium and iridium among the least easily fused. Even the most infusible and involatile metals can not only be fused but even converted into a vapor in the electric arc.

MELTING TEMPERATURE, OR FUSION POINT, OF THE METALS

Metal	Deg. F.	Metal	Deg. F.
Tin	449	Gold	1946
Bismuth	520	Copper	1982
Lead	621	Manganese	2237
Zinc	787	Nickel	2646
Antimony	1166	Chromium	2750
Magnesium	1204	Iron	2768
Aluminum	1218	Platinum	3191
Silver	1761	Tungsten	5430

The metals are all good conductors of both heat and electricity. They show, however, considerable variation among themselves. Mercury offers the greatest resistance to electricity with lead next, while silver and copper are the best conductors. Silver heads the list conducting sixty times as well as mercury. Silver is also the best conductor of heat and mercury the poorest.

RELATIVE ELECTRICAL CONDUCTIVITY OF THE METALS

Silver	62.89	Platinum	8.40
Copper	57.40	Iron	7.55
Gold	46.30	Lead	4.56
Aluminum	31.52	Mercury	1.05
Zinc	16.95		

Alloys

Often when two or more metals are fused together they blend perfectly and one metal dissolves in the other to form a homogeneous mass, so that even the most powerful microscope will not detect separate particles of the two metals in the mass. This mixture of metals we call an alloy.

An alloy has quite different properties from the average properties of the metals forming it. The following examples will illustrate this. An alloy is usually harder than the metals forming it—thus bronze is much harder than either copper or tin which form it. An alloy fuses at a much lower temperature than the metals of which it is made. Wood's metal will fuse 62° below the temperature of boiling water, while bismuth which has the lowest melting point of the metals of which it is composed fuses at a temperature 300° higher. Even the color of an alloy is not the average color of the metals composing it, for an alloy of 70% copper and 30% tin is white as is one of 75% copper and 25% nickel, and nearly all the so-called white metals are alloys of copper.

Alloys are usually less readily tarnished than are the metals because they are usually less active chemically and hence do not combine with the oxygen of the air so readily. For the same reason they resist acids and salt water better than do pure metals.

Alloys usually are less malleable and do not conduct heat and electricity so well as the pure metals. Copper to be used for electricity should, therefore, be pure and free from other metals.

An alloy of mercury with another element is known as an amalgam.

Coal Men's Statement on the Open-Top Car Problem

Argue That the Only Possible Solution of the Transportation Problem Is to Move Coal Throughout the Year—A Matter of Very Vital Importance to Mineral Aggregate Producers

THE NATIONAL COAL ASSOCIATION has issued a booklet under date of April 18, 1921, which contains matter of vital interest and importance to every other user of open-top cars, or "coal cars", as the coal men prefer to term them.

After last season's experience every sand, gravel, crushed stone and crushed slag producer now knows how intimately his business—in fact the very life of his industry—is dependent upon the manner in which coal production and transportation is handled.

The total production of mineral aggregates and other quarry products just about equals the annual production of bituminous coal, and consequently if quarry and gravel plants are to continue as users of railway transportation a way must be found for them to share equally in the railway transportation service.

Mineral aggregate producers quite generally believe—and after last season's experience with considerable reason—that the coal industry is their bitterest foe, and that they must fight the National Coal Association tooth and nail, for a fair share of available cars. Fight they must, too, when a shortage of cars actually occurs, because if they don't they may rest assured that no one else is going to fight their battles for them.

On the other hand, when transportation conditions are as they exist now, it is as much in the interest of mineral aggregate producers as it is in the interest of coal producers to move coal—to move anything, in fact. Also in the long run it may be as much to the advantage of the mineral aggregate industry as to the coal industry, to procure a more uniform distribution of transportation service throughout the year. Neither coal mines, quarries nor gravel pits are operated efficiently unless operated continuously; and the same is true, of course, of the railways.

There are but two obvious solutions of the problem of moving coal and moving mineral aggregates with railway car equipment insufficient to handle peak loads of either industry. One is to divide up the year and move coal half the time and mineral aggregates half the time—which has been approximately the practice in the past—and the other is to move

both commodities uniformly the year round so far as practicable.

Now the National Coal Association is evidently working hard for the latter solution, so far as its commodity is concerned, and it rests with mineral aggregate producers to either help or oppose this movement. It is a matter of very vital importance to them, because if coal producers can persuade consumers to take coal in the early spring and summer, just so many less cars will be available for the movement of mineral aggregates, at a season of the year when their movement is generally at a maximum. On the other hand mineral aggregate producers can cooperate with the coal producers and at the same time work for an all-the-year-round movement of mineral aggregates—if this is practicable or desirable.

THE NATIONAL COAL ASSOCIATION'S STATEMENT IN FULL

SIFTED DOWN, the underlying problem of the bituminous coal industry is that of railroad transportation. There is nothing vague or theoretical about it; just a practical problem of moving the coal from the mines.

If the mines have the cars as they are needed the public will have its coal.

And when there is an uninterrupted flow of coal, prices always will regulate themselves and always to the advantage of the consumer.

When the transportation systems break down, for any cause whatever and a shortage of cars exists at the mines, the whole scheme of supply is thrown out of joint and the nation faces a coal shortage.

Aside from the transportation feature, the soft coal industry, it is true, has at times perplexing labor difficulties involving periodical tie-ups of mines. But except for an unusual walkout, such as that of the miners in the winter of 1919-1920, strikes usually are confined, at any one time, to one or two fields.

While seriously affecting the individual output of the mines involved, sporadic strikes do not, as a rule, curtail the aggregate yearly output of the mines as a whole, so as to threaten a nation-wide coal stringency.

So transportation looms up, beyond all else, as the outstanding problem of the industry.

Just What Car Shortage Means

What makes the situation a difficult one from the viewpoint of the railroads is the stolid fact that there is a material deficiency of cars in which to haul coal. This deficiency, as calculated by Daniel Willard, chairman of the Railway Executives

Association last fall, runs to some 40,000 cars, with an aggregate carrying capacity of 2,000,000 tons on each haul.

In a year's time with normal running time at the mines, these 40,000 cars could handle something like 100,000,000 tons of soft coal, or about one-fifth of the entire supply of the nation.

Beyond this there is an estimated shortage of some 160,000 freight cars of other types than those built for coal. The mines, therefore, cannot depend upon other than open-top coal cars without the likelihood of depriving other industries of rolling stock.

With the car equipment now available the carriers must spread the haulage of coal over the entire year or, failing that, attempt to handle the major output of the mines in the period of greatest demand—the fall and winter months.

How to keep coal moving to the public, so that the railroad systems do not become clogged when there is abnormal demand is the vexing problem that confronts the soft coal industry no less than the railroads. And in the working out of this problem the public plays an essential part.

Fairly even distribution of coal the year round in order advantageously to utilize the limited car equipment at hand is the practical way out of the difficulty.

To bring this about, foresighted cooperation is needed on the part of the consumer—the large industrial user as well as the householder—in arranging for his supply of coal in the off-season, the early spring and summer months.

"No Market" Effect on Soft Coal Output

To safely see the country through its soft coal supply, as well as to meet the export demand, it is calculated that approximately 550,000,000 tons must be mined each year. The output runs higher in some years and lower in others.

Experience has shown that what is called the "line of safety" which the public, as well as the producer, must keep in mind, so as to guard against any contingency of soft coal shortage, is an average production of approximately 10,500,000 to 10,750,000 tons a week. When it falls below those figures for any material period of time there invariably is the danger of a pinch later on.

During the recent Congressional investigation into the industry it was brought out that the coal burned the country over during the seven fall and winter months each year is always greater than the amount of coal actually hauled by the railroads during that period. That means nothing else than that a very considerable tonnage of coal must be mined and hauled and stored in the consumers' bins during the other five months of the year if the contingency of a jam in transportation is to be avoided.

When there is a condition of "no market", that is lack of orders from the consumer, inevitably there comes a partial shut-down of mines. With the normal output of coal at once interrupted, there looms ahead the threat of transportation difficulty in the months to come.

Such a "no-market" condition has already been in evidence during the early months of 1921. Government reports show that the weekly production of the bituminous mines up to April 1 had severely dropped below the line of safety.

Big Slump in Production

While the weekly soft coal output averaged 12,213,000 tons in October, 1920, when production for the year had reached its peak, it began, with November, to drop. Since that month there has been a sharp decline, week by week.

In the week ending April 2 the output had slumped to 5,750,000 tons, or approximately 5,000,000 tons below the average regarded as ordinarily safe. Not since pre-war days had there been such a low average output.

The fall in output since November is shown in the following figures giving the average weekly output, month by month:

November	11,685,000
December	11,429,000
January	9,613,000
February	7,728,000
March	6,592,000

The marked drop in bituminous output since mid-winter has not been due to any lack of available cars; for there were actually thousands of open-top cars lying idle in the railroad freight yards throughout the late winter and early spring months.

Nor was the low output due to any inability on the part of the mines to turn out the coal, for miners were at hand to work the mines. It was, in fact, due alone to the failure of consumers to order stocks ahead.

In other words, it was "no-market" and nothing else. And as a result, most of the bituminous mines were running at only half capacity, while in the month of March, according to officials of the United Mine Workers of America, 100,000 miners were idle.

Railway Chief Admits Inability

On the point of the ability of the railroads to handle coal shipments, Daniel Willard, as chairman of the American Railway Executives, wrote in a letter on March 14, 1921, to former Judge John F. McGee, of Minneapolis, who during last year represented Northwestern coal consumers:

"There is no doubt at all in my mind that the railroads of this country are quite able to carry within a 12 months' period all the coal that can possibly be consumed in this country, or put over our tidewater docks for export, provided only the movement is somewhat uniform throughout the period, and I am just as certain that they cannot satisfactorily meet the transportation requirements in connection with the fuel program if the shipments are concentrated too greatly within a too limited period. At the present time, as you know, coal production in the country is not much more than half of what it was last October, November and December."

In the middle of March, 1921, Mr. Willard wrote there were "considerably over" 100,000 open-top cars, built to carry coal, lying idle.

Admittedly it may not be easy for the average consumer, once out of the winter, to think of his coal supply for the winter period to come, months away. But it is not easy, on the other hand, for the carriers to find the way to get the coal to

the consumer at the time he finally may decide, late in the fall, that he wants it put in.

Potential Output of Bituminous Mines

In reality there is no natural reason for a soft coal shortage. That is simply because there is a great, natural, relatively unlimited supply of coal lying underground in the fields of the country. Assuredly there is enough, some experts have taken the trouble to figure it, to last for some 7,000 years.

The nation's stupendous coal deposits—bituminous and anthracite—run, it is estimated, from three to four trillions of tons. By far the greater proportion of this is bituminous. In a general way, the United States is said to have more than one-half of the coal of the world.

Not only is there this enormous natural supply, but the capacity of the mines has been developed well beyond the point where they are able to take care of demands for coal in the United States as well as for export, provided that the coal can be shipped.

As to the actual capacity of the bituminous mines at present, F. G. Tryon, Statistician of the U. S. Geological Survey, said, before the Senate Committee on Manufactures:

It is very clearly at least 15,500,000 tons a week and there is some evidence pointing to a figure of 18,000,000 tons a week or possibly higher. But the most that we have ever succeeded in getting out of the ground in one week's time was about 13,150,000 tons.* So that even in that week the maximum performance, which represents a tremendous effort on the part of the railroads, failed to make it possible for the mines to operate full time.

In the soft coal fields there are some 10,000 mines, with approximately 7,000 operators engaged in running them. The larger mines, which produce the bulk of the soft coal consumed by the nation, have an aggregate output of from 200,000 to over 1,000,000 tons a year.

The soft coal industry, with its great number of mines, is essentially competitive in character. Any attempt to effect a monopoly, were one essayed, would simply cause the larger mines to increase their output or new mines to spring up.

An idea of the opportunity for sudden development of the bituminous industry is given in government reports showing that between 1917 and the latter part of 1920 from 3,000 to 5,000 additional mines were opened. In any emergency they spring up, mushroom-like, over night.

With the existing 10,000 mines working at capacity, it is estimated, more than 800,000,000 tons of soft coal could be produced each year. The highest output which the mines have been called upon to produce up to this time was 579,386,000 tons, in 1918.

Thus, so far as natural supply and the ability of the operators to mine the coal are concerned, there obviously is no occasion for a shortage of soft coal.

Not Practicable to Store Coal at Mines

To appreciate how dependent is the bituminous industry upon cars for steady operation, it must be realized that it is not practicable to store soft coal at the mines.

Facilities for storage at the mines do not, as a rule exist. The mines are usually situated in hilly country where there is literally no physical room to store the output. Even where there is physical adaptability for storage in the vicinity of

*This record output of the bituminous mines was made in the last week of October, 1919, just before the beginning of the unprecedented miners' strike when the producers were exerting their utmost to prepare for the great industrial conflict.

a mine, it would not be a practical thing because it would require coal to be handled twice and that would approximately double the cost of production.

So it has never been and is not now customary for coal to be stored at the mine. On the contrary the coal is shipped away as mined; and the mines are organized, equipped and operated so as to provide a continuous shipment of the output.

Consequently the operation of the mines from hour to hour is entirely dependent upon the presence of sufficient railroad cars every day into which the current output may be loaded and shipped to customers. Insufficiency of cars at the mines necessarily and inevitably causes a loss in the output of coal.

Even if it were feasible to store coal at the mines there would be no advantage to the public, unless there were cars available to haul it away in the time of need. Coal at the mine, whether above the ground or underneath, obviously would be of no use to the consumer in an emergency if he had no way of getting it.

Users of bituminous coal mined in the United States are divided, approximately, as follows: Industries and public utilities, 48 to 50 per cent of the output; domestic, or household, consumers, 16 per cent; railroads, 25 per cent; export and bunker, 6 per cent; mines, for operation, etc., 3 per cent.

All users of coal, including the household as well as manufacturers and public utilities, were urged by the Bituminous Coal Commission which investigated the soft coal industry early in 1920, to store coal against the pressure of demand in the winter months. On this point the commission in its report to President Wilson, wrote:

The solution of the (coal) problem is to bring about evenness of production and distribution. It is evidently the public's duty to aid in the stabilization of the coal market by purchasing and arranging to store as much coal as possible during the spring and summer.

By taking the coal when it is mined and storing it away, the public can do something for itself that the mines are unable to do.

Car Shortage Effect in 1920 Experience

How thoroughly the lack of sufficient transportation permeated the soft coal problem in 1920 and acted as the prime factor in limiting the output of the mines was clearly revealed in the Congressional inquiry.

Whichever way the investigation turned, the difficulty of obtaining a constant and satisfactory car supply kept cropping up. Inquiries directed to government experts, railroad officials and coal men alike found them agreed on the salient point that had the bituminous coal mines in 1920 been given plenty of cars there would have been no coal shortage emergency.

Equal emphasis was laid by one witness after another on the fact that the public has in its power to moderate greatly the transportation problem by ordering its coal in the off-season, so as to effect a more even distribution of the transportation burden throughout the year.

Of the actuality and the severity of the coal shortage of 1920, brought on by the lack of cars, there was ample evidence before the Senate investigators.

Although soft coal producers had begun the year with the two-fold task of meeting immediate consumption, as well as building up the reserves which had been depleted by the unprecedented miners' strike of 1919, the industry was on its way to a fair performance when it was suddenly overwhelmed, in April, by the disastrous outflow switchmen's strike.

The effects of this unexpected break of car service, which dominated the situation for months, were immediate and far reaching. By June 1 the drain of demand had resulted in reducing consumers' stocks to 20,000,000 tons, the lowest figure on record for that time of year.

Portraying the condition of car shortage and of coal shortage, Director George Otis Smith, of the Geological Survey, wrote in December, 1920, in a letter to Senator Edge, of the Senate Committee on Reconstruction and Production:

"No sooner were the rail gateways clogged with freight than delays in the placing of empty cars at the mines brought about the most acute car shortage in history. The result was a condition of stress.

"There were not lacking at that time those who denied the existence of a shortage, and predicted that the output during the remainder of the year would make good the deficiency. The fact that the deficiency has since then been largely made up does not alter the reality of the shortage which existed in the spring and summer."

As to lack of transportation being at the bottom of the 1920 coal shortage, Director Smith wrote:

Throughout the period of high prices from April to November the dominant cause limiting output has been transportation. Weekly reports, received by the Geological Survey from operators representing more than half the tonnage in the country, show that except for occasional strikes, the thing that has prevented supplying coal desired by consumers has been lack of transportation.

To the same point, illustrated by concrete figures, is the testimony of Mr. Tryon, Statistician of the Survey, who said to the Senate Committee on Manufactures:

Had it been possible when Government prices were lifted on the first of April, 1920, to immediately supply the mines with cars enough to produce 12,000,000 tons a week, as we have done during the last quarter of 1920, the emergency would have been quickly overcome. Consumers who were not getting deliveries on their contracts would have received the coal they needed and the market would speedily have been broken.

And if more were needed to make clear what happened in 1920 here is this emphatic statement of Edgar E. Clark, chairman of the Interstate Commerce Commission, expressed in a single sentence:

If all the mines had had a 70 per cent car supply there would never have been any question of car shortage because they would have had all the cars they could use.

"Snowbird" Mines and "Spot" Coal

In any soft coal stringency "spot" coal and "snowbird" mines play a conspicuous part. They did in 1920.

The sharp dislocation of the transportation arm of the industry that year caused anxious consumers who had not previously arranged for their coal, as well as contract customers who were unable to obtain full deliveries, to turn to the "spot" or free coal offered in the open market.

It was in a limited portion of this "spot" coal that there occurred the gambling which played havoc with the market and set up abnormal prices.

"Only a portion of the tonnage of the coal moving at the time was sold at these (high) prices" was the statement of Director Smith of the Geological Survey in his letter to Senator Edge. "The bulk of it remained as before, under contract, at prices negotiated before the shortage was foreseen."

"Spot" coal, it must be understood, represents only a fraction of the aggregate output of the nation's mines. The great bulk of soft coal produced is shipped on yearly contracts which cannot come under

the influence of market manipulators for the reason that prices are written into the contracts when made, usually in the spring of the year.

In ordinary times "spot" coal comprises about 20 per cent of the yearly output of soft coal, but in times of shortage it runs somewhat higher, due to the advent of the "snowbird" mines. These mines do not operate ordinarily, because of their high cost of production but await a market stringency upon which to prey. They have no responsibility as to the substantial welfare of the industry and its permanent relations to the consumer.

By throwing their output into the spot market, at the same time taking the highest prices offered by excited bidders, these "mushroom" mines exert an influence on the open market greater than their yearly tonnage would indicate.

Small Average Profit on Bituminous Coal

Evidence of bituminous operators in the National Coal Association, submitted before the Senate Manufactures Committee, based on reports embracing 100,000,000 of tonnage produced from January 1 to October 1, 1920, taking in the acute period of the shortage, showed an average sales price of \$3.47 a ton at the mine. The operators showed that the cost of producing that coal was \$2.76 a ton, leaving a gross margin of 71 cents a ton. Out of this margin, they explained, deduction must be made for taxes and interest on bonds and borrowed money, so that the actual average profit derived would be nearer 35 cents a ton.*

The operators' data covered approximately one-fourth of the tonnage for the period involved and embraced reports from all of the fields. Out of the entire output reported upon, it was revealed, 78,500,000 tons sold at prices averaging less than \$4 a ton, 14,000,000 sold at average prices between \$4 and \$5 a ton and only 7.81 per cent of the total, sold in excess of \$5 a ton. The latter was the output of small mines whose productive cost was high.

After the coal shortage had been overcome, late in the fall, due to adequate car supply, prices at all the bituminous mines dropped to normal. In some fields, after January 1, prices went to the lowest level they had reached in a year's time. In fact, the bottom literally fell out of the market.

Raise in Wages and Freight Rates Add to Cost of Coal

Although the average mine prices of bituminous coal are higher than they were before the war, the operators made it clear at the Senate hearings that the advanced cost of labor and supplies have made it impossible to sell coal on a pre-war basis, with any profit.

While the rise in the cost of supplies from 10 cents a ton to 35 and 40 cents a ton is no small item, the big factor in the increased cost of mining coal is the outlay for labor, which runs about 70 per cent of the total cost in production.

Since 1914 the soft coal industry has had to sustain six successive increases in wages. These increases have added, it is estimated, \$1.70 to the cost of each ton. On a yearly production of 550,000,000 tons this would represent an increase of \$935,000,000 in wages alone over what it cost to produce soft coal before the war.

Also, there has been a heavy advance in freight rates and delivery charges, for which the operator is in no wise responsible, but which the consumer has to pay.

*Ordinarily the actual profit of the producer on a ton of soft coal is much less than this figure.

Freight rates have approximately doubled since 1914. Where the average freight rate was about \$1.50 a ton in pre-war days, the average rate now, so far as it is possible to strike an average, is about \$3 a ton. For long distances from the mines the freight rates run much higher than \$3 a ton.

This increase of \$1.50, applied to a yearly production of 550,000,000 tons, represents an advance in the cost of coal to the consumers the country over, on account of freight charges, of \$825,000,000.

Taken together, advances in wage scales and in freight rates since 1914, it is estimated, have added \$1,750,000,000 to the yearly coal bill of the nation.

How Car Deficiency Raises Cost of Coal

It is an economic fact that car shortage exerts an immediate and unmistakable effect on the cost of producing coal. Extended observation by government experts of the experience of the industry has established the close relationship of car shortage to coal cost.

The sequence of events is inevitably this:

When cars become fewer, the working time of the mines becomes less, and the producing cost goes up. This is for the reason that certain expenses involved in keeping a mine in producing condition, such as pumping out the water and keeping the mine free from gas, are going on all the time. All of these mounting expenses incurred in time of idleness figure in the ultimate production costs when the mines resume shipping coal.

How transportation deficiency raises the cost of coal is graphically shown by charts embodying data assembled by the United States Fuel Administration. In figures the story is this:

When the car supply falls below normal by	The coal cost rises above normal by
20 per cent	12 per cent
30	19.5
40	29.0
50	40.5
60	54.5
70	74.0
80	98.0

Applying the data given in this table to any period of car shortage the advance in production cost in dollars and cents, attributable to lack of cars, may readily be estimated.

A shortage of 50 per cent in car supply, such as obtained with most of the soft coal mines in the spring of 1920, would involve a rise of from 70 cents to \$1 a ton, and more, on the production cost alone, varying with the different mining fields.

In a word, the gist of the soft coal problem today, from the standpoint of public concern, is how to make effective use of the lamentably restricted transportation facilities of the country.

To attempt to crowd the hauling of the bulk of the nation's coal into the fall and winter months is admittedly hazardous, from every viewpoint. For the consumer it means a risk as to his winter's supply that he can ill afford.

The user of bituminous coal, in fairness to himself, ought not unwittingly put himself at the caprice of a possible shortage emergency when, by using reasonable precaution, he with certainty could avoid it.

Only one logical way out is clear—to keep coal moving to the market.

If this were brought about, through active co-operation on the part of the consumer with the other forces involved, the nation never would face the danger of a coal shortage emergency.

Wisconsin Rate Case on Mineral Aggregates Progresses

Hearing Held at Madison on April 18 Gives Hope of Speedy Reduction

THE RAILWAYS operating in Wisconsin summarily rejected the proposal of the State Railroad Commission that they voluntarily reduce their freight rates on crushed stone, sand and gravel as a matter of "wise public policy," according to the report in the April 9 issue of *Rock Products*, page 50.

Thereupon the Railroad Commission announced a public hearing to be held in Madison on April 18 to show cause why the railways should not be compelled to reduce these freight rates. This hearing is reported as follows:

State Highway Engineer Testifies for Producers.

"The railroads of Wisconsin had lost \$800,000 so far this year and would lose another \$800,000 in revenue because of high freight rates on sand, gravel and crushed stone. A. R. Hirst, state highway engineer, told the members of the railroad commission today, in supporting the application of the Wisconsin Mineral Aggregate Association for lower railroad rates.

"Traffic men representing all trunk line railroads filed a vigorous protest at the public hearing against any reduction in rates. They held that war-time costs still ruled, so far as railroad operation was concerned, and a reduction of rates at this time would be serious.

"A. F. Cleveland, assistant traffic manager of the Chicago and Northwestern, told the commissioners the present scale of rates prevailing in Wisconsin was fair and should prevail until lowered operating costs justified a reduction.

"Representatives of the Wisconsin Mineral Aggregate Association, the members of which control most of the sand and gravel pits and stone quarries in the state, told the commission that unless an emergency rate, calling for a reduction in these commodities ranging from 18 to 35 per cent was granted, community gravel pits as well as quarries would be developed, resulting in a loss of investment to the material supply men.

"The freight rates on sand, gravel and crushed stone now are so high, the commission was told, that shipments by rail are impossible. Three million dollars in state aid work will be deferred until lower rates prevail. Millions of dollars in work planned throughout the state in private

enterprises is being held up pending lower rates.

"It was argued that lower rates would actually increase the earning capacity of the railroads.

"The railroad commission is not expected to hand down a decision fixing an emergency rate for several days. Shippers are confident the commission will find an emergency exists and that a reduction in rates is necessary."

New York Producers of Sand, Gravel, Slag and Crushed Stone Win Case

A RAILWAY FREIGHT-RATE DECISION of the utmost interest to the entire mineral aggregate industry was rendered on April 7 by the Public Service Commission of New York, second district.

As regular readers of *Rock Products* may recall several items have been published telling of the progress made by the producers in this case. The 40 per cent increase in freight rates on crushed stone, sand, gravel and slag, allowed by order of the Interstate Commerce Commission on August 26, 1920, was never applied in New York State. They were first suspended with the tacit consent of the railroads to avoid huge losses to contractors in fulfilling existing highway contracts.

Subsequently several hearings were held on the railroads' petition to make the 40 per cent increase effective. At these hearings the State Highway Department helped the producers and contractors to present their case. The order suspending the increase in rates was extended from time to time, the last extension being until April 30, 1921.

The new order states that the proposed increased rates "applying on sand, gravel, rock, crushed stone and slag in car lots between points in and over routes wholly within this state are disallowed."

The order affects approximately 45 railroads.

"Not only have the carriers failed to sustain the burden showing their right to the requested increases," said Commissioner Kellogg, "but the unreasonableness of the proposed increases appears conclusively on the record."

A great deal of work was done by the association of stone, sand, gravel and slag

producers in preparing and presenting this case before the Public Service Commission. The committee consisted of W. L. Sporborg, of the Rock-Cut Stone Co., Syracuse, N. Y. (chairman); John Rice, of the General Crushed Stone Co., Easton, Pa.; James Savage, of the Buffalo Crushed Stone Co., Buffalo, N. Y.; H. V. Owen, of the Gallup Sand & Gravel Co.; H. B. Snyder, of the Buffalo Slag Co., Buffalo, N. Y.; J. E. Carroll, of the J. E. Carroll Sand Co., Buffalo, N. Y.; Fred W. Sarr, First Deputy of the New York State Highway Department; W. E. MacNasser, of the Semet Solvay Co., Syracuse, N. Y.; and Wm. F. Felton and Robert J. Summers, of the Empire State Contractors' Association.

The case was prepared largely by Francis W. Brown, of the New York State Highway Department, and N. D. Chapin, of the Syracuse Chamber of Commerce, representing the Western New York State Crushed Stone Association and sand and gravel and slag interests. Owing to the able way in which they presented the case there was no doubt of its effect on the decision of the commission. It is the opinion of the producers committee that it was probably the best rate case presented before any commission in any of the states.

Chance for Reduction of Freight Rates on Agstone

THE BURDENSOME freight rates on agricultural limestone are having a serious effect in curtailing its use, particularly in Illinois and the other central west states. The National Agricultural Limestone Association is giving this matter most serious attention. Secretary A. P. Sandles reports under recent date:

"Secretary Morgan of the Kentucky State Farm Bureau writes us as follows:

"Our Legislature enacted a law providing low freight rates on limestone. This law has been in operation this year at a very great saving to our farmers. Railroads have recently protested against this.

"U. S. Senator Capper, Washington, D. C., has written to us asking for instances where excessive freight rates have hit the farmer. We forwarded some correspondence from county agents who have written to us complaining about high rates on Agstone.

"Your secretary was in Washington, April 7 and 8, and took up freight rate matters. It is the opinion of the President, Congressmen, Senators, and newspaper men that freight rates are too high and must be reduced, but they believe the wage and labor question will have to be settled first. From 60 to 70 per cent of railroad earnings go to pay labor."

Proposed Federal Legislation and Mineral Aggregate Industry

Seasonal Freight Rates on Coal—Universal Mileage Scales—Railway Inquiry

ANOTHER CONTEMPLATED OUTRAGE against sand and gravel producers, crushed stone and other users of open-top cars, appears in the form of Senate Bill S-41 introduced by Senator Frelinghuysen of New Jersey, providing for the establishment of seasonal freight rates on coal, coke and anthracite, for the purpose of inducing the movement of coal in periods when the demand therefor is light.

The proposition contemplates the establishment of lower freight rates on coal for six months of the year to create a greater demand for the same during the summer months, thereby increasing the rail movement and consequent demand for open-top cars—during a period when the movement of sand and gravel, etc., is at its maximum.

Last year the propaganda was sent out by the coal people, spreading broadcast the news of a pending coal shortage, thereby creating a great demand for coal, and an enormous increase in prices and profits. This had its effect, and as a consequence the Interstate Commerce Commission and the railroads became alarmed at the prospective calamity and issued various orders regulating the distribution of coal cars to the mines at the unwarranted financial sacrifice of other users of open-top cars. While it is true every available means at the command of sand and gravel producers was used to secure a fair share of available equipment, such efforts met with no apparent success.

This year it comes to us in a different form, but with the same ultimate end in view. Instead of having the coal producers sacrifice their revenues by making lower prices on coal during summer months to create a demand and a greater production, the railroads, whom we all know are now in a poor financial condition, will be required to suffer a further loss in their revenues by having forced upon them reduced freight rates on coal during the summer to assist the coal operators in creating a greater demand for coal, a greater production and consequent movement and use of open-top cars.

The effect of a proposition of this kind should be very apparent to sand and gravel and crushed stone producers. Normally, it will take away from them cars to which they are properly entitled for the transportation of their commodities. It is true that at the present time there

By E. Brooker
Traffic Manager, Pennsylvania Sand and Gravel Producers Association

are thousands of unused cars on the sidings of the different railroads and its immediate effect on sand and gravel producers probably passes unnoticed.

What about the future when business is normal? Can producers afford to sit idly by and permit this class legislation in favor of one class of business be established at a future sacrifice to their own business? Is there not as much justification for Congress to pass legislation reducing the now excessive and unreasonable rates on building materials to stimulate the use of these materials? This is a very important matter to every producer using open-top cars and widespread publicity should be given to the effect of this bill on the building industry—and every means be used to enlist senators and representatives against this proposal.

We have every reason to believe that the Interstate Commerce Commission has tentatively approved this proposition. We also feel that the present slump in business will cause very few objections on the part of the business world. With these facts confronting the sand and gravel and crushed stone producers, it is apparent that if the outrage of 1920 is not to be made a permanent disability to their business, every influence of the individual producers, state and national associations, should be put forth to have this bill defeated.

Proposed Universal Mileage Scale

Senator King of Utah on April 12 introduced a bill which provides "that the standard of measure of work and duty performed by a common carrier in the transportation of freight by railroad shall be the ton-mile, which is the transporta-

rate per ton mile for the transportation of freight."

The proposal contemplates a further classification of freight into five classes by the railroads. First class would move at twice the basic rate, second class at four times the basic rate, third class at six times, fourth class at eight times, and fifth class at 10 times.

We do not believe the ton mile should be considered or used in determining freight rates on sand and gravel, crushed stone, etc., as it does not present the value of these commodities from a revenue producing standpoint, in a proper light.

The ton is not a proper unit of transportation. While it is used in a good many cases as the unit on which rates are based, other transportation characteristics must enter into the measure of the charge per ton.

We all know in transportation service a train is made up of cars empty and loaded. We also know that an engine is rated as being capable of hauling a certain number of tons according to the tractive power of the engine and the contour of the locality in which the movement is made.

The weight which enters into the makeup of an engine's rating consists of net weight of the commodity and the tare or dead weight of the car. The average dead or tare weight of a car is about 20 tons and in railroad operation empty cars are usually placed at the ratio of 2 to 1 loaded car, depending to a certain extent on the nature of the commodities loaded in the cars which make up the train.

The following table is illustrative of the relationship of dead weight to net tonnage handled, based on the various weights of a commodity loaded into a car and with an engine rating of 1400 tons:

Table Showing Relation of Dead Weight to Net Tonnage

NET TONS LOADED IN CAR	GROSS WEIGHT OF LOADED CAR IN TONS	NUMBER OF LOADED CARS IN TRAIN	DEAD WEIGHT OF CARS	NET TONNAGE OF REVENUE FREIGHT
20	40	35	700	700
30	50	28	560	840
40	60	23	460	940
50	70	20	400	1000

tion of one ton of 2,000 pounds' weight of freight the distance of one mile," and that on or before January 1, 1922, "each carrier shall make and establish a basic

It will be seen that on a commodity loading to 20 tons to the car, a railroad handles only 700 tons of revenue freight.

On sand and gravel loading to 50 tons

to the car with the same engine they handle 1,000 tons of revenue freight per train.

It is very apparent that sand and gravel requires a lesser number of cars to transport a given tonnage. It requires a smaller investment and the charges for interest, depreciation, taxes and repairs would be lower per ton on account of the lesser number of cars used, caused by the heavy loading of the commodity.

In terminal service the car is the unit of transportation exclusively. The nature of the commodity loaded into the car, the kind of car, or the weight loaded into the car does not change the cost per car to an appreciable extent. Each loaded car requires the same amount of transportation handling, the same routine as to billing, car records accounting, auditing, collection of freight charges, etc.

The weight therefore loaded into a car, however, does influence the measure of the cost per ton. It is apparent therefore that sand and gravel loading to 50 tons to the car costs less per ton in terminal service than lighter loading commodities, due to the distribution of costs among a greater number of units.

Taking into consideration the relationship of empty car mileage with facts given above, it is very apparent that the measure of rates should be determined by considering two transportation factors, terminal and road haul, using the per car costs in terminal service and the costs per ton of gross weight handled to arrive at the ultimate measure of the total rate.

The basic charge per ton-mile loses to the producer of sand and gravel the chief argument he has for low rates per ton on account of the heavy loading of these commodities, and if a proposition of this kind is allowed to be established, the results may prove disastrous to even the present rate structure and also cause the elimination of all present competitive rates.

It appears to be a serious question which sand and gravel producers and other producers of heavy loading commodities cannot afford to overlook at this time. The bill should be strenuously opposed and if not defeated it should be so amended as to recognize the favorable transportation characteristics of sand and gravel which entitles it to a low rating per ton.

Cummins Inquiry Resolution

Senator Cummins, chairman of the Senate Committee on Interstate Commerce, submitted April 12, the resolution providing for an inquiry by his committee into the railroad situation. It was referred to the Committee on Contingent Expenses. If it is adopted, as it is expected it will be, Senator Cummins plans to start the inquiry about May 1. The resolution follows:

"That the committee on interstate commerce is hereby authorized and directed to inquire into and report to the Senate

as speedily as practicable upon the following matters, to-wit:

"First—The operating revenues and expenses of the railroads of the country which under the law make reports to the Interstate Commerce Commission, comparing these revenues and expenses with like revenues and expenses (including the period of Federal control), since 1912.

"Second—The reasons which led to the extraordinary cost of maintenance and operation from March 1, 1920, to March 1, 1921.

"Third—The reasons which induced the diminished volume of traffic in the latter part of the year 1920 and the first two months of 1921, and in that connection the influence of the increased freight and passenger rates prevailing during that period.

"Fourth—The efficiency or inefficiency of railroad management during Federal control and during the year beginning March 1, 1920, and the efficiency or inefficiency of labor employed by the management during the same periods.

"Fifth—The best means of bringing about a condition that will warrant the Interstate Commerce Commission in reducing freight and passenger rates.

"The committee is authorized to act under this resolution either as a whole or through any sub-committee appointed for the purpose; to subpoena witnesses, administer oaths, send for persons and papers; and to employ counsel, experts and stenographers. The expense incurred shall be paid from the contingent fund of the Senate, upon vouchers approved by the chairman of the committee."

Particular attention is directed to third and fifth sections of this resolution under which it appears that sand and gravel producers will have the opportunity of proving that the high freight rates on sand and gravel have materially retarded the movements of these commodities, encouraged truck transportation, decreased railroad hauls and have a tendency to encourage the opening of local banks producing inferior materials as well as the necessity for lower rates on these commodities which we believe will be followed by greater revenues to the railroads.

Colorado Sand Producers to Join National Association

PLANS FOR THE ADMISSION of seven Colorado dealers into the National Association of Sand and Gravel Dealers were laid at a meeting of the executive officers of the national organization at the Brown Palace Hotel in Denver recently. Heretofore the Platte River Sand and Gravel Co., of Denver, has been the only Western company represented in the organization. Floyd C. Wilson, secretary of this company, who is district governor of the national association, is in charge of the movement to

admit the seven other Colorado producers into the association.

Rates on Sand

IN A TENTATIVE REPORT on No. 11504, Rock Products League of Chicago vs. C., B. & Q. et al., Examiner E. L. Beach has recommended a finding that the joint rates on sand from the Ottawa district, on 214 carloads, shipped at various times since 1916, to Albion, Mich., were unreasonable to the extent that they exceeded the aggregate of the intermediates based on Joliet. Both factors were increased under General Order No. 28, but Beach said that the question raised by that fact went only to a determination as to whether the resulting rate, without considering the rule of the fourth section pertaining to the aggregate of intermediates, was reasonable.

Examiner H. W. Archer, in a report to the Commission on No. 11729, Rock Products Traffic League vs. C., B. & Q. et al., dealt with the same subject and recommended that when the Commission deals with his report it also consider Beach's. The Archer report also covers No. 11799, Same vs. Same; and No. 11810, Same vs. C., R. I. & P et al.

In his collection of cases, Archer recommended a holding that the joint through rates on sand from the Ottawa district to Benton Harbor and Kalamazoo, Mich., and Kokomo, Ind., be held unreasonable to the extent that they exceeded the aggregate of the intermediates based on Joliet. He also said reparation should be made in No. 11729, but that the complainants in the other cases did not make proper proof of damage. His conclusion as to them was that the record before him did not warrant an award of reparation.—"Traffic World."

Rate on Wet Marl

A FINDING of unreasonableness and an award of reparation have been made in a report on No. 11209, Peerless Portland Cement Co. vs. Michigan Central, opinion No. 6778, 61 I. C. C. 169-72, the Commission holding that a rate of \$15 per car on wet marl from Spring Arbor to Union City, Mich., during federal control was unreasonable to the extent that it exceeded \$7.50 per car. The traffic amounted to 15 cars of marl per day, the engine and crew hauling the raw material for cement making a round trip each day. Equipment was furnished by the complainant. The complainant also performed practically all the terminal service in connection with the movement, and for the past five years it has borne the cost of maintaining the plant tracks which the Michigan Central had assumed. Under the circumstances, the Commission said, the rate which yielded 46.9 cents per car mile was excessive and reparation is to be made.—"Traffic World."



Editorial Comment



It is not very often that patent office specifications make interesting articles. Occasionally, however, the inventor of a process tells enough about it, in good understandable English, to make the specification a real contribution to scientific and trade literature. The patent specifications elsewhere in this issue describing a new process for manufacturing Keene's cement are such an example.

In view of the great value of Keene's cement mixed in a small proportion with lime mortar, as described in the April 7 issue of *ROCK PRODUCTS*, for an interior plaster material, the development of a process for making this material, much cheaper than any previous process, is matter of interest to the whole plaster-making fraternity.

This issue contains a long exposition of the transportation problem facing the bituminous coal industry.

It is given fully in *ROCK PRODUCTS* because all rock producers and operators now know that their transportation problem is inseparably linked with the coal situation. Associations of mineral aggregate producers have made "a fair distribution of open-top cars" a watchword. What *is* a fair distribution?

Does a fair distribution of transportation mean moving coal in the fall and winter months when coal is in most demand, and moving mineral aggregates and other construction materials in the spring and summer months, when construction materials are most in demand? Or does it mean that an effort should be made to get all these materials moved all the year round, so far as possible?

The coal men are figuring how they can move coal with an admitted shortage of open-top equipment—how they can use some of the cars in May, June and July, say, that ordinarily would be kept busy at that time moving construction materials. They are not carrying any of the burdens of the man who must move sand, gravel, stone and slag. Consideration of these materials does not enter into their calculations. They know the railways prefer to move coal rather than mineral aggregates, if there is an opportunity to choose. Coal is *long-haul* business and mineral aggregate is *short-haul* business—and there is hardly a railway traffic man who thinks there is any profit in the *short-haul* business. Maybe it is so; anyhow the producer of mineral aggregate faces a condition and not a theory.

Theoretically, it would seem that the best thing for all concerned is to move all the materials using open-top cars, as near the year round as possible, hoping that by so doing the efficiency of the railways would be increased enough that they could take care of all the busi-

ness offered them. Practically, however, we believe there are many objections and many obstacles to moving mineral aggregates at any other time than during the most active period of the construction season, when under present normal conditions, *coal does not move* in any great quantity.

Obviously it is a problem that requires the most earnest thought and consideration on the part of mineral aggregate producers. For the coal industry has already taken its stand and explained its position. Experience has taught mineral aggregate producers that the coal industry is not going to get gray hairs trying to figure out how the railways can move coal and sand at the same time. Their attitude has been and probably will continue to be, to ignore the mineral aggregate industry entirely.

There is another reason why producers of sand, gravel, and crushed stone will find the statement of the coal operators interesting. It is quite a comprehensive analysis of the broad operating problems of the industry. In many respects the production of mineral aggregates, in its broadest conception, is very similar to coal production. If the coal operators contend that the value of their product is too low to pay for storage and re-handling, how about commodities of about one-third the value of coal?

If coal must be mined continuously in order to operate efficiently, how about quarrying and gravel pit operations? It is easy to mine coal the year round, but a few inches of snow would make a gravel operation very nearly impossible. Hence, if the price of coal *must* be high as a result of inefficient intermittent operation of the mines, is there any reason why the price of the product of a quarry or gravel pit should not be high for the same reason?

Contracts are beginning to be let and there are prospects of a good year for producers of building and construction material. Wisconsin has already let contracts for considerably more than 200 miles of concrete highways—more than twice as much as was let in all of last year. New York, Pennsylvania and Ohio are now letting contracts for considerable mileages.

The general building situation is also improving week by week. Statistics gathered by "National Builder" show much activity in house and school building. A recently published statement says there are 200,000 new school buildings needed in the United States immediately. The prophets who predicted a good year but a late start appear to have been just about right.

Business Is Picking Up



General Market News



Proposed Amendments to Federal Transportation Law

REPRESENTATIVE SWEET, of Iowa, member of the House committee on interstate commerce, is preparing an amendment to the transportation act which would repeal that part of section 15a directing the Commission to prescribe a level of rates that will yield as nearly as may be a net annual railway operating income of 5½ or 6 per cent on the aggregate value of carrier property devoted to the service of transportation.

"I am of the opinion that the question of rate making should be left to the sound discretion of the Commission, without being hedged about by arbitrary rules and provisions of law," said he.

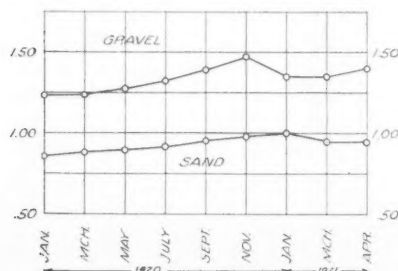
Mr. Sweet believes that the regulation of rates by the Commission should be restored to the status existing before the enactment of the transportation act. The amendment which he proposes to submit would be intended to accomplish that purpose and provision for division of excess earnings would be eliminated.

The requirements of the rate-making section of the transportation act impose an almost impossible task on the Commission, Mr. Sweet said, because of the difficulties in arriving at a proper valuation of carrier property.

The increases in rates authorized by the Commission to meet the mandate of the rate-making section, coupled with the depression in business, has prevented the movement of traffic, Mr. Sweet said.

"It would appear that the railway executives of the country have looked on the raising of rates as a remedy and overlooked the important question that rates can be so high that they will be destructive not only of railway transportation and railway business, but all other classes of business which come in contact with and are dependent upon the railways," said he.

At the last session of Congress, Mr. Sweet expressed the view that the labor provisions of the transportation act should be amended to provide for the establishment of adjustment boards such as



Hope!

FREIGHT CARRYING CHARGES have mounted higher and higher until commerce is halted and production discouraged.

Railway rates and cost of operation must be reduced.—President Harding.

existed under the Railroad Administration during federal control. He has not decided whether he will offer an amendment to the labor sections, but he says there should be a method, at least, whereby adjustment boards could handle a great part of the work which now goes to the Railroad Labor Board and that the board should be used as an appeal tribunal to settle disputes that are not settled by the lower boards.—"Traffic World."

Colorado Cement Plant Bill Defeated in the House

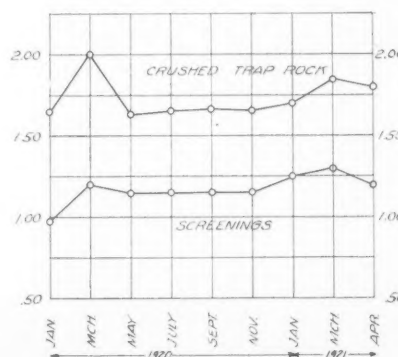
THE BILL by Senators Booth, Callen and Young, providing for the construction of a \$500,000 state cement plant at the penitentiary, was defeated in the Colorado House of Representatives by one vote. The vote stood 27 to 26.

This bill was passed in the Senate after a long and bitter fight by a vote of 18 to 17, as noted in the April 9 issue of Rock Products.

Sand, Gravel and Crushed Stone Prices

THE ACCOMPANYING CHARTS show the average prices of sand, gravel and crushed stone for 1920 and 1921 to date. The plotted points represent the average prices of about 30 representative cities quoting in Rock Products.

The figures at the right and left of the charts are dollars per ton f. o. b. plant or nearest shipping point.



Indiana to Pay 70 Per Cent on Delivered Material

ADVANCE PAYMENTS to public works contractors of 70 per cent of the value of material delivered on a job site will be approved by the state board of accounts under certain conditions for a temporary period, according to an announcement which went out from the state office recently to county auditors, township trustees, school officials and architects in Indiana.

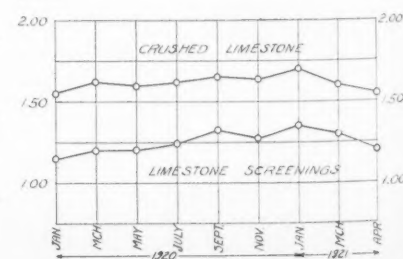
The advances are to be limited to the following materials used in buildings: Brick, terra cotta, structural iron, metal and wood lath, radiators, furnaces, stone, crushed stone, framing timber and plumbing fixtures, and to the following materials used in roads: Stone, steel, gravel, brick, crushed stone, creosoted blocks for bridge flooring.

The arrangement is to prevail until further notice or until December 31, and was made because of general economic conditions, the announcement says. At least 15 per cent of all estimates on buildings and 20 per cent on roads is to be retained for at least 31 days after the completion of the contract, the announcement points out, in order to comply with a 1911 law.

Three conditions to govern the advances are set out in detail. One has to do with the filing of duplicate invoices, the second with requested inspection of material by a representative of the accounts board, and the third with provisions for protecting job site material from weather elements, prescribing that from October 1 to April 1 roofs must be placed over the material and for other protective arrangements.

Low Bid of 98 Cents per Yard for Crushed Stone

A CONTRACT for 4,000 cubic yards of crushed stone for road work near Salem, Ore., was awarded to D. Samuels at 98 cents a yard. This bid does not include haulage of the material. Last year the price for crushed stone at this place under similar conditions was \$1.14 per yard.



New Illinois Secretary on Association Advantages

J. D. PIERCE, the new secretary of the Illinois Concrete Aggregate Association, greets his members with the following very pertinent suggestions:

"There is one phase of association work which is so vital to your success and so urgently needed at the present time that your secretary wishes to most earnestly bring it to your attention. This is the matter of holding zone meetings and the great duty of every member to attend.

"No association of business men can hope to get the greatest benefit for its members without well-attended meetings. The results of the meetings will become apparent to all if they are conducted on the proper plan and if competitors have a desire to treat each other fairly and work for the permanent welfare of themselves and the industry.

"The frequency of the meetings is determined by various conditions; but if a meeting is held there are very few good reasons for being absent. If a producer repeatedly fails to attend meetings with his competitors, then the meetings are not being properly conducted or he is lacking in the co-operative spirit which every association member should have.

"Meetings are the only means of acquainting new members with association methods and transmitting information for mutual benefit. The new member becomes a good member only as he learns from contact with his brother producers. You cannot expect him to have confidence in the association and in you until you have shown yourself worthy of that confidence. It is a matter of acquaintance AT THE MEETINGS. Meetings give the best or only way of transmitting vital information and exchanging ideas. Every producer should know and has a legal right to know what his competitor has been doing. False reports, quoting from men who are trying to buy your goods, are the most dangerous factors in business co-operation. Meetings permit you to learn the truth before you act. Ideas are exchanged on improved equipment, costs, freight rates, labor conditions, terms of sale, credits and collections, specifications and inspections, and many other points for the mutual good."

New York Highway Bids Are Low

BIDS RECENTLY opened on 80 miles of highway work in New York State showed a total low bid of \$3,033,292, which was \$253,800 under the engineers' estimate. This gives a rough price of \$38,000 per mile for the 80 miles. The bidding was pretty close, there being no great difference between the high and low bidder. There were in all 85 bidders, or an average of four for each of the 22 projects.

Tennessee Stone and Gravel Rate Hearing on April 25

THE INTERSTATE COMMERCE COMMISSION will hold a hearing in Nashville, Tenn., April 25, on freight rates on crushed stone and gravel. The Tennessee railroad commission refused to permit the railroads to make a 25 per cent increase in the state on such material. It is said that the increase in rates would cause an increase in highway construction costs of about \$600 a mile.

The railway men were not satisfied with the state commissions' ruling and consequently have appealed to the Interstate Commerce Commission.

D. L. & W. R. R. Puts on Daily "Cement Extra"

THE INCREASED DEMAND for cement in the East has caused shipments of such volume that the Delaware, Lackawanna and Western R. R. has been compelled to run an extra cement train daily between Hoboken, N. J., and Portland, Pa., to take care of this increase.

Proposed Federal Aid Legislation

THREE HUNDRED MILLION dollars would be provided for federal aid in road construction during the next four fiscal years, under the terms of a bill introduced immediately after Congress convened on April 11 by Representative McArthur, of Oregon. The appropriation would be divided into four equal parts of \$75,000,000 each, to be available, respectively, on July 1 of each of the years of 1921, 1922, 1923 and 1924.

The creation of a Department of Federal Highways and the establishment of a national highway system is sought by Representative Osborne, of California, in a measure which he has introduced in the House. The national highway system would comprise not less than three main trunk-line roads from the Atlantic to the Pacific, and not less than four main trunk-line roads from the northern to the southern boundaries. At least two such roads would go through each state in the Union. The roads would be constructed and maintained by the Government and would be the property of the United States. An appropriation of \$100,000,000 is provided to carry out the purposes of the bill immediately, and \$200,000,000 would be provided each fiscal year from July 1, 1921, for eight years.

The question of roads and road maintenance will receive the serious attention of Congress during the present session, in view of the President's attitude as expressed in his message to Congress on April 12. Delegations representing the various good roads movements have

been to the White House several times, and the President has announced his belief that no funds should be provided for road construction in states which fail to make adequate provision for the maintenance of the roads so built.

President of National Crushed Stone Association in Mexico

E. J. KRAUSE, of St. Louis, Mo., president of the National Crushed Stone Association, sends a message from Mexico. He finds Mexico a land of wonderful opportunities, but since Mr. Krause's interests are so varied—running from limestone quarries and coal mines to orange groves and dairy farms—it is not clear that he means opportunities in the quarry line!

Mr. Krause writes that every possible courtesy was extended his party by President Obregon himself, including a banquet and dance. Americans are more popular in Mexico now than a short time back.

Prices of Concrete and Sand-Lime Brick Drop

OF SPECIAL NOTE during the past few weeks is the drop in sand-lime brick and concrete brick prices. A drop of from \$1 to \$2 per M for common concrete brick seems to be the average while for the face brick the drop averages about \$5 per M. The sand-lime brick drop is from \$1 to \$2 per M. This decrease comes only from about one-third of the cities listed, but these quotations seem to be a fair indication of the trend in brick prices.

Of interest in this connection is the recent announcement of common clay brick prices in St. Louis and Chicago of \$12 per M—the lowest since the War.

New Silica Sand Industry on Pacific Coast

THE DEL MONTE Properties Co. has installed at Lake Majella, Calif., a complete plant of the same type as the most modern and up-to-date plants used in the silica glass sand districts of Pennsylvania, West Virginia and other states, for washing and drying silica sand. The process through the plant involves washing the sand in fresh water and drying it by steam, and eliminates the vegetable and other impurities, resulting in a thoroughly clean, bone dry product.

The company is now prepared to ship the untreated sand loaded direct from pit to cars and ships this sand in gondola cars. The washed and dried sand is shipped either in sacks or in bulk by utilizing paper-lined box cars. The product is a white beach sand.

New Machinery and Equipment

New Brown Recording Thermometer

A RECORDING THERMOMETER that is claimed by its manufacturers to be different from any other thermometer now made, in that it incorporates fifteen of the latest constructional advantages, such as:

Pen Arm Adjustable—The pen arm is completely adjustable with setscrews for "set" and "tension."

Calibrating Means—The helix is adjustable for calibrating.

Moisture-Proof Case—Every instrument is supplied with a moisture-proof case as standard equipment.

Automatic Pen Release—Lifts pen automatically when door is opened.

Patented Chart Clips—Automatically locks the chart when the door is closed.

Seth Thomas Clock, Eight-Day Movement—Attached to front plate, so that clock must at all times be in alignment with chart, and can be removed, if necessary for cleaning in two minutes.

Many charts for ranges from minus 40 degrees F. to plus 1,000 degrees F. are carried as standard equipment.

This new thermometer is enclosed in a serviceable black enameled case and ring. Other special features are open graduations on the chart, inverted pen arm, and heavy bronze reinforced tubing.

The manufacturer is the Brown Instrument Co., Philadelphia, Pa.

New Idea in Chain Making

WITH THE LARGE NUMBER of improvements in electric welding, the trade is now being supplied almost universally with electric weld chain in all the smaller sizes up to 1/2-in. and 3/4-in. material.

There are a number of different methods of forming and welding the links but in all cases there is a flash of material at the point of welding brought about by the intense heat of the electric current and by jamming the two ends of material together when the weld is accomplished. Some manufacturers have left this flash, or swell, without trying to remove it because of the extra strength that it gives the weld, while other manufacturers have invented means of either grinding or shearing the flash away so as to make the link smooth at the welded point.

A new method of electric welding has just been devised and is offered to the trade under what is known as "Inswell" chain." By this method all of the material at the flash, or welding point, is retained, but by a special device is forced to the inside of the link; thus retaining the strength at the weld that was formerly retained by leaving the swell all the way around. An illustration of this new method of welding is given, which indicates very clearly the form of the link that is thus secured.

The manufacturers of this chain claim that by this method the welded portion is

25 per cent stronger than any other part of the link and repeated breaking tests have shown that the material will pull out at all other places than the weld when tested to destruction. This kind of chain is very smooth on the outside of the links and the swelled portion on the inside of the link gives it the additional strength. The benefit of the improvement is quite apparent to anyone.

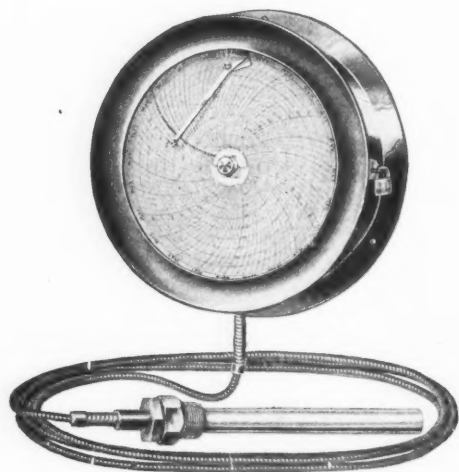
The method of manufacturing to this special pattern is patented and the name "Inswell" has been copyrighted by the manufacturers, The Columbus McKinnon Chain Co., Columbus, Ohio.

Shovel Attachment for Drag-Line Excavator

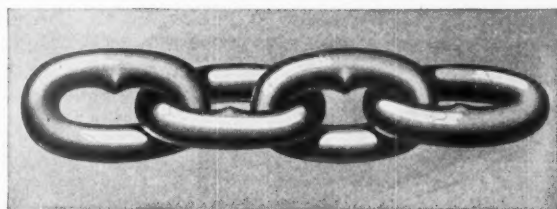
THE PAWLING AND HARNISCH-FEGER CO., Milwaukee, Wis., is now manufacturing a shovel attachment for its 205 or 206 K. C. excavators. The attachment consists of the following parts: Dipper and dipper handle, boom, boom foot socket casting, thrusting shaft complete, operating lever bearing, brake treadle with ratchet, and necessary levers for same; thrusting chain, set of boom swing braces. These parts can be applied to all machines, without additional drilling of any kind.

The Dipper

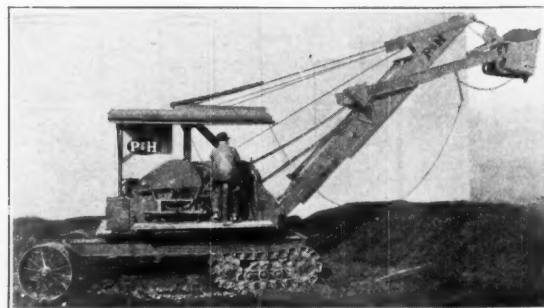
The dipper is constructed with a steel plate shell; steel plate front; steel plate lip; steel plate door; annealed steel cast-



Brown recording thermometer



New method of welding chain



P. and H. shovel attachment for drag-line excavator

ing back; forged teeth with hardened points, and forged hinges.

The dipper is of $\frac{1}{2}$ -cu. yd. capacity.

The dipper handle consists of two members designed to straddle the boom; each member having an oak core, armored with steel plates on all four sides. The dipper handle racks are Manganese steel castings. The dipper handle end is a single steel casting. The dipper braces are steel forgings. All pin joints on both dipper and handle are bushed with hardened steel bushings.

Boom

The boom is constructed of structural steel plates and shapes, in the form of a box section, so designed that all the rivets are driven from the outside, and easily get-at-able. The boom foot is a single annealed steel casting, securely riveted to the structural member.

The shipper shaft is a high carbon steel forging. The shipper shaft bearings are annealed steel castings, bronze bushed; the saddle blocks are annealed steel castings, bronze bushed for the shipper shaft, and provided with renewable cast iron slide plates. The boom swing braces are steel forgings with turnbuckles for adjustment.

Thrusting Shaft

This shaft interchanges with the forward drum shaft of the regular machine. It is provided with a sprocket, loosely mounted on the shaft for operating the

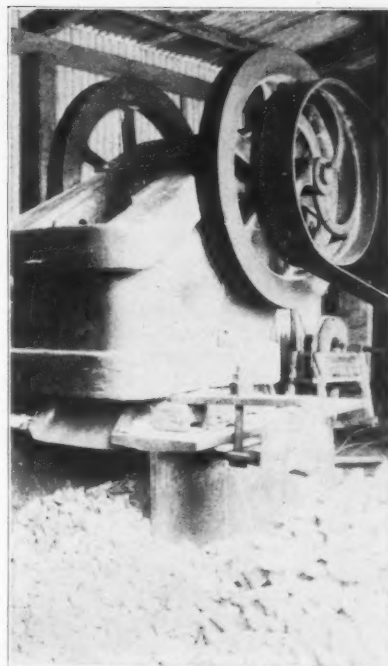
shipper shaft thrust. Suitable mechanism is provided, to enable this sprocket to be rotated in either direction for thrusting out, or drawing in, the handle.

New Stone Crusher Designed in Sweden

A STONE CRUSHER developed in Sweden during the close of the world war greatly simplifies the working parts of the later day crushers of the jaw type. The power is transmitted from the crankshaft to the oscillating jaw through a lever and through a roller mounted between the roller and the jaw. The jaw is formed with a concave face upon which the roller rolls without sliding friction and without need of lubrication.

The lever is constructed in two parts kept together by a hinge and by a safety bolt, arranged to break for an overload, caused for instance by a sledge-hammer between the jaws. When such an overload occurs and the bolt breaks, the motion of the lower part of the lever stops. The upper part of the lever continues to move, swinging on the hinge, until the motive power is shut off, and a new safety bolt inserted.

The safety bolt is strong enough to stand any normal strain. Under the head of the bolt a cupped disk of hardened steel is placed, designed to deflect somewhat more than the bolt can stretch. It is stated that during the war the machine gave greater



Exterior view of the crusher

efficiency than machines of older types and that less driving power was required for operation and the wear was held to a minimum because of the great ratio between the two arms of the lever and therefore the long throw of the crank and the less pressure on the bearings and the smaller diameter of the crankshaft. There was also less need of lubrication, because of the less pressure upon the bearings and the reduction in number of bearings.

The new stone crusher was designed and developed by Gustav Rennerfelt, Timmermangatan 43, Stockholm, Sweden.

Machinery Price Cuts

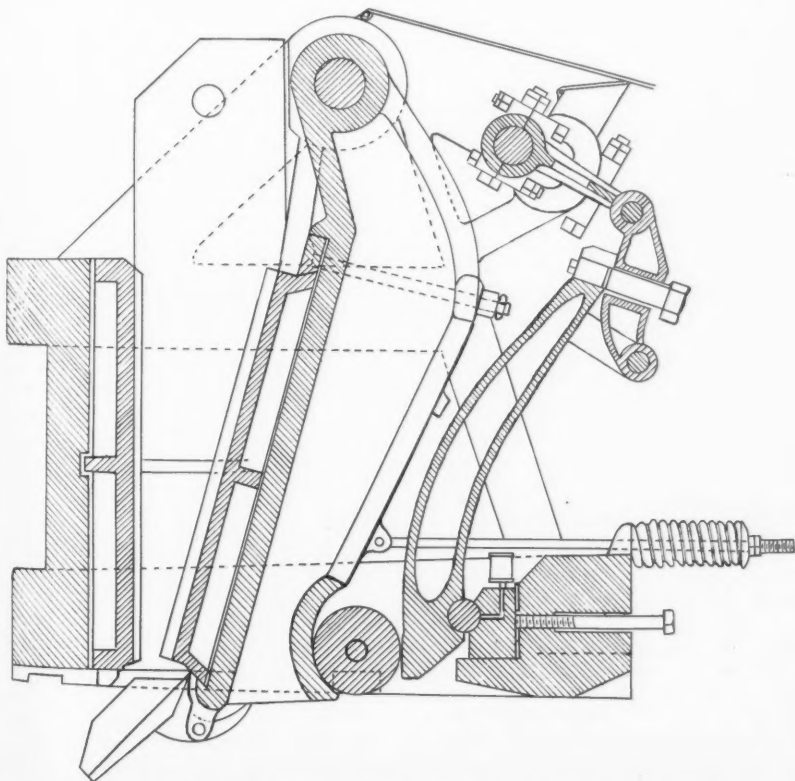
THE SHRINKAGE in business has given us an opportunity to restore the economies in manufacture that had to be sacrificed during the high pressure of the past three years, says an announcement of the Link-Belt Co., dated April 15.

Our overhead expenses have been reduced, the efficiency and output of our men have been increased, our raw materials have been marked down to the present market.

All of the reductions in cost effected through these steps, together with a considerable portion of our profits, have been applied to price reductions.

This general price reduction applies to our complete lines of Elevating and Conveying Machinery, our Malleable Iron and "SS" Class Steel Chains, Malleable Iron Buckets, and Sprocket Wheels.

A new 272-page revised price list No. 334 has just been issued.



Cross-section through jaw crusher showing location of roller and lever

Accident Prevention

Quarry Cars and Haulage— Car Operation

(Prepared for Rock Products by the Engineering Department of the National Safety Council)

AT SOME PLANTS the practice of spragging is followed. Probably the most common cause of accidents in spragging is workmen getting hands caught between sprag and the car bed. Sprags if used should be about 18 in. long, so that workmen will have sufficient hand room and will thus be less likely to have hands pinched.

In some quarries it is customary to use blocks for slowing down or chucking cars, especially at the mine bottom. In blocking, accidents usually occur when hands are caught between the wheel and block or between block and rail. Several types of blocks have been used, some with a handle protruding from side of block and others with a handle at back end of block. On account of rough usage, blocks with handles protruding from the side soon have the handles broken off and are then dangerous to use. The handle, which projects at back of block, is considered best.

Shoes

Shoes act somewhat like blocks in that they are placed on the track ahead of moving cars. The car wheel runs up on the shoe which slides along rail. This is a protection to the car wheels as there is no wear on the wheel, the only wear being on the shoe that lies on the rail. On steep grades the use of shoes is considered safer than spragging. A shoe having one flange (on inner side) will pass over frogs in the railway track. If the grade is on straight track with no frogs or turnouts, shoes may be made with two flanges to be sure that the shoe holds the rail. The use of shoes puts a greater braking force on cars than spragging, as the shoe has several inches contact with the rail, whereas the car wheel has only a small area. An efficient brake is recommended in preference to the use of sprags, blocks or shoes.

Braking

Whenever cars, either empties or loaded, are left on sidings or layoffs, the brakes should be securely set, and if cars are not equipped with brakes they should be spragged or blocked. In addition to this precaution all sidings and lay-offs should be equipped with derailing switches, so that, should cars become loose, they will be ditched rather than run onto a main haulage-way. The normal position of such derailing switches should be open, it being necessary to close the switch before cars can be removed to other tracks.

Putting on Wrecks

The National Safety Council finds that many accidents occur to men while putting on cars which have been derailed. These are frequently due to jacks slipping and to the use of the so-called "jack stick", which is set with one end against side of car so that when car is pulled it is lifted and shoved onto the track. This practice should be prohibited as it is dangerous to the men and injurious to cars. Car replacers (derailing dogs) should be carried on locomotives for the purpose of putting on wrecked cars. Under no conditions should men attempt to hold or brace the car replacer with their feet or hands. If necessary, it should be brace against the track ties or the wall.

Trip Rider

Brakemen should never ride on the front end of a car or train of cars being pushed; many accidents have resulted from this practice when cars have collided or jumped the track and run into a wall. A motor whistle or gong should be used freely when pushing cars. When cars are pulled, brakemen should always ride at the rear end of the train.

Undoubtedly the safest practice is to pull all car trips—that is, with the motor on the front end. In some quarries tracks have been so laid out that this practice cannot be followed, and it is necessary to pull in the empties and push out the loaded cars, or vice versa.

The making of flying switches should be prohibited at all plants. This practice has been the cause of many serious and fatal accidents; but little more time is required to make switches safely.

Enginemen and Motormen

Motormen should always keep a sharp lookout ahead for obstructions on the track and for workmen or others who may be on the track, and should sound the alarm gong or whistle when coming near curves, switches, cross-overs, doors or partings. Motormen should always report any defect in tracks, and need of repairs to motor parts. Motormen should not leave a trip standing where it will be endangered by other motors or obstruct the ventilation.

Motormen should not attempt to bump open a door with their motor, but should wait until the snapper opens the door. The snapper should not jump off in front of locomotive, but to one side. Motormen should not attempt to speed up, but should keep within a safe speed limit (to be determined by the company officials) and always keep the train under control.

Motormen should not handle the con-

trollers of the motor unless he is in the motor cab; if it should start up he may trip and fall and the motor get away from him. One of our members has taken the precaution of requiring all motormen to turn in their control levers at end of each shift. These are locked up so that no one can start a motor without securing a control lever from person in charge of the equipment. This practice is recommended to all plants using electric power locomotives, as it prevents tampering with motors, and also eliminates the possibility of an accident caused by some unauthorized person running them into the mine.

Locomotives (Motors)

Only authorized persons should be permitted to run locomotives. Each locomotive should be equipped with a gong or whistle, and such equipment should always be maintained in good condition.

Care of Equipment

Accidents frequently are the result of motors or cars being out of repair. The motor brakes may not operate properly; the sand pipes may become stopped up; car beds may be loose on trucks; the coupling bar bent out of line; the brake shoes lost or brake lever bent; door-latches broken; wheel flanges worn too thin; hand holes on tram cars may be loose or missing; and various other defects are always coming up, which should be attended to at once.

The National Safety Council advises that every locomotive and car be numbered, the number to be plainly painted on the equipment or else a metal number plate used. A periodical inspection of all equipment should be made by a competent person and a record made of all cars and locomotives which are in need of repair. If any defects are found which may lead to an accident the car or locomotive should be taken out of service until repairs have been made. In addition to this regular inspection which should be reported on a special form provided therefor, all employees should be encouraged to report defective equipment or conditions likely to lead to an accident.

Man-Trip Trains

Men going to and from work should not be permitted to ride in cars loaded with material or tools. The safer method is to provide man-trip cars. The man-trip cars should then be placed on siding until end of shift and then used for hauling workmen out.

Where workmen are hauled to work in the quarry cars they should not be permitted to carry tools with them. Tools may be placed in a separate car.



General Market News



Conditions in the Lehigh Valley Cement District

CEMENT PRODUCTION in the Lehigh Valley section of Pennsylvania is growing nearer and nearer towards normal as the weeks go by. The outlook is encouraging and the different plants now idle are making ready for early resumption. Shipments are noticeably on the increase and primarily for domestic account; the export call is very weak, and probably from 2 to 5 per cent of current production is all that is finding its way to other countries. Under normal conditions, the export shipments range from 15 to 25 per cent. The labor situation is good, and there is little or no trouble in securing men in desired quantity. Efficiency of labor, also, shows evidence of betterment.

The call for cement in the eastern markets is on the increase, and the near-revival of construction activities, as now prevailing, is lending aid to the situation in price firmness and fair distribution. As set forth in the last issue of *Rock Products*, building material dealers are showing no hesitancy in placing orders, indicating a good run of inquiries for material from contractors and builders. The price at New York holds at \$4.10 a barrel, delivered on the job, with bag rebate of 25 cents, or \$1.00 a barrel. The demand in Greater New York is light at the present time as compared with the call from the suburban sections, where considerable home-building is under way. As anticipated, the drop in cement bags is shown on the part of a number of manufacturers, but dealers with well-stocked warehouses are holding at the old level until the supply has been depleted. It will probably be about a month before a new established figure has been reached.

Dealers at Boston, Mass., are holding cement at \$4.20 a barrel, a decided decline from the \$4.75 level, noted in the last issue of *Rock Products*. In paper, the material is quoted at \$4.05. Common lime is selling in this market at \$3.50 a barrel, 180 pounds net, and for \$5.00 for the 280 pound barrels. Dealers at Providence, R. I., are maintaining the \$5.00 barrel figure, delivered, with bag rebate of 22½ cents.

The prices of cement in upper New York state cities vary from \$4.10 to \$5.00 a barrel "on the job," while at Utica, a \$5.15 figure is prevailing. The \$5.00 level is to be found at Elmira, Albany and outlying districts, while the \$4.10 quotation follows closely on the line of the Greater New York territory. New Jersey dealers are asking prices varying from \$4.50 to \$5.00, including sacks, while at Philadelphia, Pa., the last noted figure is popular at the present time.

The past fortnight has brought the second mill of the Lehigh Portland Cement

Co. at Ormrod into service, placing the company's operation on close to a normal basis. All plants are now running, with manufacture gradually on the increase. The Atlas Portland Cement Co. has resumed operations at its large No. 4 mill at Northampton at full production; for some time past this plant has been engaging at about one-half of capacity. The smaller mills are falling into line rapidly, placing idle equipment on the producing end and calling for cars for loading at their sidings.

The Bureau of Accident Prevention and Insurance of the Portland Cement Association recently held an interesting meeting at the Chamber of Commerce Building, Allentown. About 80 foremen and superintendents from the various mills in this section were present, a total of 18 cement companies being represented. H. G. Jacobsen, manager of the bureau, presided. One of the principal addresses was made by T. F. Halpin of the Marquette Cement Co., La Salle, Ill., who told of the plans and methods for accident prevention prevailing in that district.

President Harding Insists on Maintenance of Federal-Aid Roads

EVERY PRODUCER of rock products used in highway construction will endorse President Harding's views of road maintenance. In his message to Congress, he said:

"Transportation over the highways is little less important, but the problems relate to construction and development and deserve your most earnest attention, because we are laying a foundation for a long time to come, and the creation is very difficult to visualize in its great possibilities.

"The highways are not only feeders to the railroads and afford relief from their local burdens; they are actually lines of motor traffic in interstate commerce. They are the smaller arteries of the larger portion of our commerce, and the motor car has become an indispensable instrument in our political, social, and industrial life.

"There is begun a new era in highway construction, the outlay for which runs far into hundreds of millions of dollars. Bond issues by road districts, counties, and states mount to enormous figures, and the country is facing such an outlay that it is vital that every effort shall be directed against wasted effort and unjustifiable expenditure.

"The federal government can place no inhibition on the expenditure in the several states; but, since Congress has embarked upon a policy of assisting the

states in highway improvement, wisely, I believe, it can assert a wholly becoming influence in shaping policy.

"With the principle of federal participation acceptably established, probably never to be abandoned, it is important to exert federal influence in developing comprehensive plans looking to the promotion of commerce, and apply our expenditures in the surest way to guarantee a public return for money expended.

"Large federal outlay demands a federal voice in the program of expenditure. Congress cannot justify a mere gift from the federal purse to the several states, to be prorated among counties for road betterment. Such a course will invite abuses which it were better to guard against in the beginning.

"The laws governing federal aid should be amended and strengthened. The federal agency of administration should be elevated to the importance and vested with authority comparable to the work before it. And Congress ought to prescribe conditions to federal appropriations which will necessitate a consistent program of uniformity which will justify the federal outlay.

"I know of nothing more shocking than the millions of public funds wasted in improved highways, wasted because there is no policy of maintenance. The neglect is not universal, but it is very near it. There is nothing the Congress can do more effectively to end this shocking waste than condition all federal aid on provisions for maintenance.

"Highways, no matter how generous the outlay for construction, cannot be maintained without patrol and constant repair. Such conditions insisted on in the grant of federal aid will safeguard the public which pays and guard the federal government against political abuses which tend to defeat the very purposes for which we authorize federal expenditure."

Iowa Material Law Not a Law!

AN ERROR was made in *Rock Products*, April 9, 1921, page 46, in stating that the proposed law aimed to prevent material men from discriminating against the state, contractors on public work, county authorities, etc., *had become law*. It seems the bill was passed by the lower house of the state legislature, but never got any farther before the adjournment of the legislature on April 8. The item as published is interesting only in showing how the minds of our state legislators are working—and to show that such a law after all would not be such a bad thing for the producer.

The Rock Products Market

Wholesale Prices of Crushed Stone

Prices given are per ton, F. O. B., at producing plant or nearest shipping point

Crushed Limestone

City or shipping point	Screenings, ¾ inch down	¾ inch and less	¾ inch and less	1½ inch and less	2½ inch and less	3 inch and larger
EASTERN:						
Blakeslee, N. Y.	1.00	1.00	1.50	1.50	1.50	
Buffalo, N. Y.			1.35 per net ton, all sizes			
Burlington, Vt.	1.00	2.50	2.00	2.00	2.00	
Chaumont, N. Y.	1.75	1.75	1.75	1.50	1.50	1.50
Cobleskill, N. Y.	1.35	1.35	1.25	1.25	1.25	
Eastern New York .....	.90	1.80	1.70	1.60	1.60	1.50
Eastern Penna.	1.00		1.85	1.85	1.85	1.85
Grove, Md.	1.45	2.50	2.40	2.00	1.60	1.45
Munns, N. Y.			All sizes 1.50			
Utica, N. Y.	1.00		All other sizes 1.50			
Walford, Pa.	1.25	1.75	1.75	1.75	1.75	1.75
Western New York .....	.70	1.25	1.25	1.25	1.25	1.25
CENTRAL						
Alden, Ia. ....	.80@1.00	.80@1.00	1.50	1.45		
Alton, Ill.	2.25	2.25	1.75	1.75		
Bettendorf, Ia.		All sizes, 2.00 cu. yd. f.o.b. quarry				
Buffalo, Ia.	1.00	1.35	1.45	1.25	1.35	1.35
Chicago, Ill.	1.40	1.60	1.40	1.40	1.40	1.40
Cincinnati, Ohio		2.00	2.00	2.00		
Columbia, Ill.	2.15	1.90	2.00	2.00	1.90	1.90
Davenport, Ia.	1.50*	1.50*	1.50*	1.50*		
Dundas, Ont.	1.00	1.50	1.50	1.50	1.25	1.20
Eden and Knowles, Wis.	1.30	1.30	1.30	1.30	1.30	
Greencastle, Ind.	1.50	1.40	1.25	1.25	1.25	1.25
Illinois, Southern	2.00	1.75	1.75	1.50		
Kokomo, Ind.	1.10	1.25	1.25	1.10	1.10	1.10
Krause or Columbia, Ill.	1.80	1.30	1.50	1.40	1.30	1.30
Lannon, Wis.	1.00	1.10	1.10	1.10	1.10	1.10
Lima, Ohio	1.70	1.60	1.50	1.50	1.50	1.50
Linwood, Ia.	1.00		1.45	1.25	1.25	
Marblehead and Brillion, Wis.	1.10		1.20	1.10	1.10	
Mayville, Wis. ....	.95@1.00		1.20	1.20	1.20	1.20
Montrose, Ia.	1.35	1.75	1.75@1.85	1.75	1.65@1.75	
Oshkosh, Wis.			1.40 per ton, all sizes			
River Rouge, Mich.	1.50	1.65	1.65	1.50	1.50	1.50
St. Louis, Mo. ....	.60	1.60				
Sheboygan, Wis.	1.25	1.25	1.25	1.25	1.25	1.25
Stolle, Ill. (I. C. R. R.)	2.25		1.75	1.75	1.75	1.75
Stone City, Ia. ....	.60		1.55	1.35	1.45	
Toronto, Canada	1.90	2.40	2.40	2.40	2.15	2.10@2.15
SOUTHERN:						
Cartersville, Ga.		1.85		1.75	1.75	1.65
Chickamauga, Tenn.		1.75	1.75	1.75	1.75	1.75
Columbia, S. C.	1.00@1.25	3.50	3.50	3.50		
El Paso, Tex.	1.00	1.00	1.00	1.00	1.00	
Fort Springs, W. Va.	1.45	1.60	1.80	1.65	1.45	
Garnett, Okla.			1.60	1.60	1.45	
Ladds, Ga.	1.75	1.75	1.75	2.00	2.00	
Mascot, Tenn.		1.50	2.00		1.50@2.00	
New Braunfels, Tex. ....	.60	1.50	1.50	1.25	1.25	1.25
WESTERN:						
Atchison, Kans. ....	.50	2.10	2.10	2.10	2.10	2.10
Blue Springs and Wymore, Neb. ....	.20	1.65	1.65	1.60@1.65	1.45@1.50	1.40
Cape Girardeau, Mo.	1.50		1.50	1.50	1.25	
Kansas City, Mo.	1.00	2.00				

Crushed Trap Rock

City or shipping point	Screenings, ¾ inch down	¾ inch and less	¾ inch and less	1½ inch and less	2½ inch and less	3 inch and larger
Baltimore, Md.	1.25	2.50	2.35	2.25	2.00@2.25	2.00
Bernardsville, N. J.	2.00	2.20	2.00	1.80	1.50	1.50
Brantford, Conn.	.80	1.95	1.80	1.60	1.40	1.40
Birdsboro, Pa.	1.40	1.90	1.80	1.60	1.60	1.40
Bound Brook, N. J.	2.00	2.30	2.10	1.75	1.75	2.00
Dresser Jct., Wis.	1.00	2.45	2.45	2.15	2.00	2.00
Duluth, Minn.	.75@1.00	2.25	1.90@2.00	1.40@1.50	1.40@1.50	1.50
Dwight Station, Calif.	2.10	2.35	2.15	1.75	1.85	1.85
E. Summit, N. J.	1.60	1.95	1.75	1.50	1.50	1.50
Eastern Mass.	1.60	2.25	1.95	1.80	1.80	1.75
Eastern Penna.	.60@1.00	1.60@1.80	1.60@1.80	1.40@1.50	1.20@1.30	1.10
Hill, Meriden, Conn.	1.10	1.10	1.10	1.10	1.10	1.10
Oakland, Calif.	.50*	1.45@1.75	1.40@1.70	1.30@1.60	1.25@1.55	1.25@1.55
Richmond, Calif.	.50@.70	2.15	2.15	2.00	1.85	1.75
San Diego, Calif.	2.15	1.35	1.30	1.20	1.20	1.20
Springfield, N. J.	.60	1.35	1.30	1.20	1.20	1.20
Westfield, Mass.	1.00	2.00	2.00	2.00	2.00	2.00

Miscellaneous Crushed Stone

City or shipping point	Screenings, ¾ inch down	¾ inch and less	¾ inch and less	1½ inch and less	2½ inch and less	3 inch and larger
Baltimore, Md.—Gneiss	1.00	2.75	2.40	2.20	2.10	1.75
Columbia, S. C.—Granite	.75	2.75	2.75	2.50	2.35	2.00
Dundas, Ont.—Flint	1.10	1.10	1.10	1.10	1.10	1.10
Eastern Penna.—Sandstone	1.20	2.00	2.00	1.70	1.70	1.70
Eastern Penna.—Quartzite	.90	1.70	1.55	1.20	1.20	2.00
Holton, Ga.—Granite	.40	1.25@1.50	1.15@1.40	1.15@1.40	2.00	2.00
Los Angeles, Cal.—Granite	.50	2.50	2.50	2.25	2.00	2.00
Macon, Ga.—Granite	4.00	2.00	2.00	2.00	2.00	2.00
Middlebrook, Mo.—Granite	.50	2.00	1.90	1.75	1.75	1.75
Stockbridge, Ga.—Granite	.50	2.00	1.90	1.75	1.75	1.75

*Cubic yard. †Agrl. lime. ||R. R. ballast. §Flux †Rip-rap. a 3-inch and less.

Agricultural Limestone

EASTERN:	
Coldwater, N. Y.—Analysis, 56.77% CaCO ₃ , 41.74% MgCO ₃ —70% thru 200 mesh, 95% thru 40 mesh; bags, 5.00; bulk	3.25
Chaumont, N. Y.—Analysis, 95% CaCO ₃ , 1.14% MgCO ₃ —Thru 100 mesh; sacks, 4.50; bulk	2.75
Grove City, Pa.—Analysis, 94.75% CaCO ₃ , 1.20% MgCO ₃ —70% thru 100 mesh; 80 lb. ppr., 5.50; bulk	4.50
Grove, Md.—50% thru 50 mesh; paper bags, 6.50; bulk	4.50
Hillsville, Pa.—Analysis, 96% CaCO ₃ —70% thru 100 mesh; sacks, 4.75@5.00; bulk	3.00@3.25
Jamesville, N. Y.—Analysis, 89.25% CaCO ₃ , 5.25% MgCO ₃ ; sacks, 4.50; bulk	2.75
New Castle, Pa.—95% CaCO ₃ , 1.4% MgCO ₃ —75% thru 100 mesh, 84% thru 50 mesh, 100% thru 4 mesh; sacks, 5.00; bulk	3.25
Syracuse, N. Y.—Analysis, 90% carbonates—50% thru 100 mesh, 90% thru 50 mesh; sacks, 3.50; bulk	2.75
Texas, Md.—Analysis, 58.02% CaCO ₃ , 37.3% MgCO ₃ —50% thru 50 mesh; bags, 4.25; bulk	2.50
Walford, Pa.—50% thru 100 mesh, 60% thru 50 mesh, 100% thru 10 mesh; sacks, 5.00; bulk	3.25
West Stockbridge, Mass., Danbury, Conn., North Pownal, Vt.—Analysis, 90% CaCO ₃ —90% thru 100 mesh; paper bags, 6.25—90% thru 50 mesh; paper bags, 5.25; bulk	3.25
West Stockbridge, Mass.—Analysis, 95% combined carbonates; 33% thru 200 mesh, 66% thru 100 mesh, 100% thru 20 mesh; sacks 5.25@5.50; bulk	3.25
Williamsport, Pa.—Analysis, 88-90% CaCO ₃ , 3-4% MgCO ₃ —50% thru 50 mesh; bulk	4.00@5.50
CENTRAL:	
Alden, Ia.—Analysis, 99.16% CaCO ₃	.80
Alton, Ill.—Analysis, 96% CaCO ₃ , 0.75% MgCO ₃ —50% thru 4 mesh; Pulverized limestone	4.50
Bedford, Ind.—Analysis, equivalent 98.5% CaCO ₃ —90% thru 100 mesh	1.60@2.00
Belleville, Ont.—Analysis, 90.9% CaCO ₃ , 1.15% MgCO ₃ —45% to 50% thru 100 mesh, 61% to 70% thru 50 mesh; bulk	2.50
Cape Girardeau, Mo.—Analysis, 90% CaCO ₃ , .044% MgCO ₃ —50% thru 4 mesh	1.50
Chicago, Ill.—Analysis, 53.63% CaCO ₃ , 37.51% MgCO ₃ —90% thru 4 mesh	1.50
Columbia, Ill., near East St. Louis—½-in. down	1.25@1.80
Detroit, Mich.—Analysis, 88% CaCO ₃ , 7% MgCO ₃ —75% thru 200 mesh, 2.50@4.75—60% thru 100 mesh	1.80@3.80
Elmhurst, Ill.—Analysis, 55.73% CaCO ₃ , 20.69% MgCO ₃ —50% thru 50 mesh	1.25
Greencastle, Ind.—Analysis, 98% CaCO ₃ —50% thru 50 mesh	2.00
Howenstein, O.—100% thru 10 mesh, 59% thru 50 mesh, 39% thru 100 mesh	2.75@3.00
Lannon, Wis.—Analysis, 54% CaCO ₃ , 44% MgCO ₃ —90% thru 50 mesh	2.00
Marblehead, O.—Analysis, 83.54% CaCO ₃ , 14.92% MgCO ₃ —52.4% thru 100 mesh, 59% thru 50 mesh, 100% thru 10 mesh; sacks, 5.25; bulk	3.00
Mayville, Wis.—Analysis, 53.65% CaCO ₃ , 43.72% MgCO ₃	1.75@2.00
McCook, Ill.—Analysis, 54.10% CaCO ₃ , 45.04% MgCO ₃ —100% thru ¾-in. sieve, 78.12% thru No. 10, 53.29% thru No. 20, 38.14% thru No. 30, 34.86% thru No. 50, 22% thru 100	1.50
Milltown, Ind.—Analysis, 91.59% CaCO ₃ , 4.87% MgCO ₃ —24% thru 200 mesh, 33.6% thru 100 mesh, 40% thru 50 mesh, 50% thru 40 mesh, 70% thru 20 mesh	1.65
Mitchell, Ind.—50% thru 100 mesh	2.00
Montrose, Ia.—90% thru 100 mesh	1.25
Narlo, O.—Analysis, 56% CaCO ₃ , 43% MgCO ₃	1.25
Ohio (different points), 20% thru 100 mesh; bulk	1.50@1.75
Piqua, O.—Analysis, 82.8% CaCO ₃ , 8.2% MgCO ₃ ; neutralizing power in terms of calcium carbonate, 95.3%—50% thru 100 mesh	3.50@5.50
50% thru 50 mesh	1.75@2.00
Ridgeville, Ind.—Analysis, 98% CaCO ₃ —100% thru 4 mesh	1.75

(Continued on next page.)

Agricultural Limestone

(Continued from preceding page.)

River Rouge, Mich.—Analysis, 54% CaCO ₃ , 40% MgCO ₃ ; bulk.....	.80@1.40
Stolle, Ill., near East St. Louis, on I. C. R.—Thru 1/4-in. mesh—Analysis, 89.61% to 89.91% CaCO ₃ , 3.82% MgCO ₃	2.25
Stone City, Ia.—Analysis, 98% CaCO ₃ —90% thru 50 mesh.....	.60
Toledo, O.—Analysis, 52.72% CaCO ₃ , 43% MgCO ₃ —20% thru 100 mesh, 30% thru 50 mesh, 80% thru 100 mesh, 100% thru 5/32 screen.....	1.80
Whitehill, Ill.—Analysis, 97.12% CaCO ₃ , 2.50% MgCO ₃ —90% thru 100 mesh.....	5.00
50% thru 50 mesh.....	2.00
Yellow Springs, O.—Analysis, 96.08% CaCO ₃ , 63% MgCO ₃ —32% thru 100 mesh, 38% thru 50 mesh, 99% thru 10 mesh; sacks, 8.25.....	5.25

SOUTHERN:

Blowers, Fla.—Analysis, 98% combined carbonates—75% thru 200 mesh.....	5.00
Cartersville, Ga.—Analysis, 96% combined carbonates—pulverized limestone.....	1.75@2.00
Claremont, Va. (Marltime)—Analysis, 90.94% CaCO ₃ , 0.31% P, 1.36% Mg, 0.37% K; 100 lb. paper bags, 6.00; 100 lb. cloth bags, 6.50; bulk.....	3.50@4.50
Dittlinger, Tex.—Analysis, 99.09% CaCO ₃ , .04% MgCO ₃ —90% thru 100 mesh.....	2.00@3.00
90% thru 4 mesh.....	1.00@2.00
Grovania, Ga.—Analysis, 95% CaCO ₃ , no MgCO ₃ —50% thru 100 mesh.....	2.50
Hopkinsville, Ky.—Analysis, 94.6 to 98.1% CaCO ₃ ; bulk.....	2.00
Knoxville, Tenn.—Pulverized.....	2.50
90% thru 100 mesh.....	2.00
90% thru 50 mesh.....	1.50
Ladds, Ga.—Pulverized limestone.....	2.50
Linnville Falls, N. C.—Analysis, 53% CaCO ₃ , 42% MgCO ₃ —50% thru 100 mesh; sacks, 4.50; bulk.....	3.00
Memphis, Jct., Ky.—Analysis, 95.31% CaCO ₃ , 1.12% MgCO ₃ ; average price 1/4 in. down.....	2.00
Mascot, Tenn.—Analysis 52% CaCO ₃ , 38% MgCO ₃	3.00
80% thru 100 mesh.....	2.50
All thru 10 mesh.....	5.00
80% thru 200 mesh.....	
Paper bags, \$1.50 extra per ton; burlap, \$2.00 extra per ton.....	
Maxwell, Va.—Analysis, 76.6% CaCO ₃ , 22.83% MgCO ₃ —100% thru 20 mesh; 100 lb. ppr., 7.00; bulk.....	2.50
Ocala, Fla.—Analysis, 98% CaCO ₃ —75% thru 200 mesh.....	4.50

WESTERN:

Colton, Calif.—Analysis, 95% CaCO ₃ , 1 1/4% MgCO ₃ —all to pass 14 mesh; bags, 5.00; bulk.....	3.50
Sacks, 15c returnable.....	
Garnett, Okla.—Analysis, 86% CaCO ₃ , 50% thru 4 mesh.....	.50
Kansas City, Mo., Corrigan Sidg—50% thru 50 mesh; bulk.....	2.00
Oro Grande, Calif.—Analysis, 94% CaCO ₃ , 2% MgCO ₃ —85% thru 200 mesh; bags, 10.25; bulk.....	4.00
Terminus, Calif.—Analysis, 96.2% CaCO ₃ , .04% MgCO ₃ —60% thru 200 mesh, 90% thru 100 mesh, 95% thru 50 mesh, 100% thru 4 mesh; sacks, 6.00; bulk.....	5.25
Tulsa, Okla.—90% thru 4 mesh.....	.50

Miscellaneous Sands

Silica sand is quoted washed, dried and screened unless otherwise stated.

GLASS SAND:

Beach City, O.—Washed and screened.....	3.00
Berkeley Springs, W. Va.....	2.50
Bridgeton, N. J.—Washed, 2.50; dried.....	3.00
Cedarville and South Vineland, N. J.....	2.25@2.75
Cheshire, Mass.....	5.00@7.00
Columbus, Ohio.....	2.50@3.00
Gray Summit, Mo.....	2.50@4.00
Hancock, Md.—Damp.....	2.00
Klondike and Pacific, Mo.....	2.50@3.00
Leesburg, Pa.—Core, and molding coarse.....	3.00
Mapleton, Pa.—Dry.....	4.00
Glass, damp.....	3.00
Massillon, Ohio.....	3.50
Millington, Ill.....	2.25@3.00
Mineral Ridge, Ohio.....	3.50
Montoursville, Pa.—Green, washed.....	2.00@2.75
Montgomery, W. Va.....	3.00@3.25
Oregon, Ill.—Large contracts.....	2.00@2.75
Ottawa, Ill.....	2.00@2.25
Pittsburgh, Pa.—Dry, 4.00; damp.....	3.00

(Continued on next page)

Wholesale Prices of Sand and Gravel

Prices given are per ton, F. O. B., at producing plant or nearest shipping point

Washed Sand and Gravel

City or shipping point	Fine Sand, 1/10 inch down	Sand, 1/4 inch and less	Gravel, 1/2 inch and less	Gravel, 1 inch and less	Gravel, 1 1/2 inch and less	Gravel, 2 inch and less
EASTERN:						
Ambridge, South Heights, Pa.....	.75	1.30	.75	1.30	1.00	1.00
Attica, N. Y.....	.75	.75	.75	1.00	1.00	1.00
Eric, Pa.....	.48	1.00	.48	1.65	1.50	1.75
Farmingdale, N. J.....	.90	1.25	.90	1.15	1.15	1.15
Hartford, Conn.....	.60@.75	2.00	.75	1.75	1.65	1.50
Leeds Junction, Me.....	.75	.75	1.70	1.50	1.50*	1.50*
Ludlow, Mass.....	.50@.60	1.30	.60	1.30	.85	1.35
Pittsburgh, Pa.....	.75	1.00	.75	1.50	1.50	1.50
Portland, Maine.....	.75	.75	2.00	1.40	1.20	1.20
Texas, Md.....	.75	.75	2.00	1.40	1.20	1.20
Washington, D. C.....	.75	.75	2.00	1.40	1.20	1.20
CENTRAL:						
Alton, Ill.....	.85	.85	.85	1.00	1.00	.90@1.00
Anson, Wis.....	.50@.60	.50@.60	.50@.60	1.00	1.00	1.00
Attica and Covington, Ind.....	.90	.90	.90	1.00	1.00	1.00
Barton, Wis.....	.70	.70	.70	.80	.80	.80
Beloit, Wis.....	.60	.60	.60	.80	.80	.80
Chicago, Ill.....	1.75@2.25	1.75@2.43	1.75@2.43	1.15	1.15	1.15
Cincinnati, O., and vicinity.....	1.20	1.15	1.15	.90@1.25	.90@1.25	.90@1.25
Columbus, O.....	.90	.90@1.25	.90@1.25	1.15	1.15	1.15
Des Moines, Ia.....	1.00	.75	1.60	1.60	1.60	1.60
Detroit, Mich.....	.65	.65	.65	.95	.95	.95
Earlestead (Flint), Mich.....	.70	.70	.70	.95	.95	.95
Eau Claire, Wis.....	.40@.50	.60	.60	1.25	1.10	1.10
Elgin, Ill.....	.65	.80	1.00	.80	.80	.80
Elkhart Lake, Wis.....	.57	.57	1.00	.77	.77	.77
Grand Rapids, Mich.....	.80	.70	.80	.90	.85	.85
Greenville, Mechanicsburg, O.....	.80	.70	.80	1.00	.85	.80
Hawarden, Ia.....	.70	.70	.70	1.30	1.30	1.30
Humboldt, Ia.....	1.35	2.20	2.20	2.20	2.20	2.20
Indianapolis, Ind.....	.60	.60	.60	1.50	.75@1.00	.75@1.00
Janesville, Wis.....	.65@.75	.90	.90	.65@.75	.65@.75	.65@.75
Le Mars, and Doon, Ia.....	.90	.90	.90	1.80	1.80	1.80
Lincoln, Neb.....	.80	.80	.80	1.30	1.30	1.30
Mason City, Ia.....	.90	.90	.90	1.80	1.70	1.65
Milwaukee, Wis.....	1.30	1.30	1.40	1.40	1.40	1.40
Minneapolis, Minn.....	.50	.50	1.50	1.50	1.50	1.50
Moline, Ill.....	1.00	1.00	1.30	1.30	1.30	1.30
Oxford, Mich.....	.60	.60	.60	.85	.85	.85
Riton, Wis.....	.85	.85	.85	.85	.85	.85@1.00
St. Louis, Mo., f. o. b. cars.....	1.60	1.65	1.80	1.60	1.60	1.55
Summit Grove, Clinton, Ind.....	.90	.90	.90	1.00	1.00	1.00
Terre Haute, Ind.....	1.00@1.25	1.00	1.25	1.25	.90@1.25	.90@1.25
Winona, Minn.....	.70	.60	2.00	1.75	1.50	1.25
Yorkville, Moronts, Oregon and Sheridan, Ill.....	.90	.90	.90	.90	.90	.85
SOUTHERN:						
Alexandria, La.....	.60@.90	.60@.90	.60@.90	1.40@1.50	1.50	1.65@1.85
Charleston, W. Va.....	.85	.85	.85	1.25	1.40	1.25
Dougherty, Okla.....	2.00@2.25	2.00@2.25	2.00@2.25	2.25	2.25	2.25
Flomaton, Ala.....	2.00@2.25	2.00@2.25	2.00@2.25	2.75@3.00	2.75@3.00	2.75@3.00
Ft. Worth, Tex.....	1.10	1.10	1.10	1.00	1.00	1.00
Greenville, Miss.....	1.05	1.05	1.05	1.20	1.00	.95
Jedburg, Mo.....	1.15	1.15	1.15	2.15	1.95	1.75
Knoxville, Tenn.....	.75	.75	.75	1.50	1.50	1.50
Lake Weir, Fla.....	.75@1.00	.75@1.00	.75@1.00	1.50	1.50	1.50
Macon, Ga.....	1.40	1.40	1.40	1.50	1.50	1.50
Memphis, Tenn.....	1.30	1.30	1.30	1.75	1.25	1.00
N. Martinsville, W. Va.....	1.00	1.00	1.00	1.75	1.25	1.00
New Orleans, La.....	1.25	1.25	1.25	1.75	1.25	1.00
Pine Bluff, Ark.....	.92	.92	.92	1.25	1.25	1.25
Roseland, La.....	.70	.70	.70	1.25	1.25	1.25
Tulsa, Okla.....	.70@.80	.70@.80	.70@.80	1.25	1.25	1.25
Waco, Texas.....	.70@.80	.70@.80	.70@.80	1.25	1.25	1.25
WESTERN:						
Grand Rapids, Wyo.....	.50	.50	.50	.85	.80	.80
Kansas City, Mo.....	(Kaw River sand, car lots, .75 per ton, Missouri River, .85)	.50	.50	.85	.80	.80
Niles, Calif.....	1.00	1.00	1.00	1.40	1.00	1.00
Pueblo, Colo.....	1.10*	1.00*	1.00*	1.50*	1.50*	1.50*
Roseburg, Ore.....	2.00	1.75	2.00	1.75	1.75	1.75
San Diego, Calif.....	.80@1.00	.80@1.00	1.30@1.60	1.25@1.55	1.15@1.45	1.10@1.40
San Francisco, Calif.....	1.00	1.00	1.00@1.20	.85@1.00	.85@1.00	.85@1.00
Seattle, Wash.....	1.50*	1.50*	2.00*	1.50*	1.50*	1.50*

Bank Run Sand and Gravel

City or shipping point	Fine Sand, 1/10 inch down	Sand, 1/4 inch and less	Gravel, 1/2 inch and less	Gravel, 1 inch and less	Gravel, 1 1/2 inch and less	Gravel, 2 inch and less
Attica, Covington, Silverwood, Ind., and Palestine, Ill.....	.75	.75	.75	.75	.75	.75
Boonville, N. Y.....	.60@.80	.55@.75	.55@.75	1.00 per yd.	1.00 per yd.	1.00
Cape Girardeau, Mo.....			.80 per ton—1.20 washed			
Cherokee, Ia.....	1.10*	1.10*	1.10*	1.10	1.10	1.10
Detroit, Mich.....	.70	.58	.90	.72	.72	.72
Dudley, Ky. (Crushed Sand).....	.65@.85	.75@.85	.60	.60	.60	.60
Elkhart Lake, Wis.....	.70	.70	.70	.70	.70	.70
Fishers, N. Y.....	.65@.85	.75@.85	.60	.60	.60	.60
Ft. Jefferson, Mechanicsburg, O.....	.70	.70	.70	.70	.70	.70
Greenville, N. Y.....	1.00*	1.00*	1.00*	1.00*	1.00*	1.00*
Hartford, Conn.....	.60	.60	.60	.60	.60	.60
Hersey, Mich.....	.65	.65	.65	.65	.65	.65
Janesville, Wis.....	.85	.85	.85	.85	.85	.85
Lindsay, Tex.....	.85	.85	.85	.85	.85	.85
Oxford, Mich.....	.85	.85	.85	.85	.85	.85
Pine Bluff, Ark.....	.75	.75	.75	.75	.75	.75
Roseland, La.....	.75	.75	.75	.75	.75	.75
Saginaw, Mich., f. o. b. cars.....	.65	.65	.65	.65	.65	.65
St. Louis, Mo.....	.65	.65	.65	.65	.65	.65
Summit Grove, Ind.....	.65	.65	.65	.65	.65	.65
Valde Rouge, La.....	.80	.80	.80	.80	.80	.80
Waco, Texas.....	.50@.75	.50@.75	.50@.75	1.50	1.50	1.50
Yardville, N. J.....	1.10@1.20	1.10@1.20	1.10@1.20	1.50	1.50	1.50
York, Pa.....	1.10@1.20	1.10@1.20	1.10@1.20	1.50	1.50	1.50

*Cubic yard. B Bank. L Lake. || Ballast.

Crushed Slag

City or shipping point	Roofing	1/4 inch down	1/4 inch and less	1/2 inch and less	1 1/2 inch and less	2 1/2 inch and less	3 inch and larger
EASTERN:							
Bethlehem and Emmaus, Pa.	2.50	.90	1.50	1.20	1.20	1.20	1.20
Buffalo, N. Y.	2.35	1.25	1.25	1.25	1.25	1.25	1.25
E. Canaan, Conn.	4.00	1.10	2.50	1.35	1.25	1.25	1.25
Eastern Pennsylvania and Northern New Jersey							
Erie, Pa.	2.50	1.20	1.50	1.20	1.20	1.20	1.20
Emporium, Pa.	2.35	1.25	1.25	1.25	1.25	1.25	1.25
Lebanon, Pa.	2.50	.85	1.50	.85	.85	.85	.85
Sharpville and West Middlesex, Pa.	2.00	1.30	1.70	1.30	1.30	1.30	1.30
Western Pennsylvania	2.50	.75	1.50	1.20	1.20	1.20	1.20
CENTRAL:							
Chicago, Ill.			All sizes, \$1.50, F. O. B. Chicago				
Detroit, Mich.			All sizes, 1.65, F. O. B. Detroit				
Ironton, O.	2.40		other grades 1.75@2.00				
Jackson, O.	2.00	1.35	1.70	1.35	1.35	1.35	1.35
Stuebenville, O.	2.00	1.40	1.70	1.40	1.40	1.40	1.40
Toledo, O.	2.20	1.70	1.95	1.95	1.95	1.70	1.70
Youngstown, Dover, Hubbard, Leetonia, Struthers, Steubenville, Lowellville & Canton, O.							
	2.00	1.30	1.70	1.30	1.30	1.30	1.30
SOUTHERN:							
Alabama City, Ala.	2.05	1.00	1.25	1.25	1.25	1.00	.95
Ensley, Ala.	2.05	1.00	1.25	1.25	1.25	1.00	.95
Longdale, Goshen, Glen Wilton and Low Moor, Va.	2.50	1.00		1.25	1.25	1.15	1.05

Agricultural Lime and Hydrate

	—Agricultural Lime—		Per Cent CaO	Per Cent MgO	Agricultural Hydrate
	Bulk	Bags			Bags
EASTERN:					
Adams, Mass.		8.00	58	0.5	
Bellefonte, Pa.	9.00		98.2	.72	
Berkeley, R. I.			50	18	15.00
Branchton, Pa.		5.50			
Cassadaga, N. Y.—Marlime	8.00	10.00	48.07	1.08	
Cedar Hollow, Devault, Rambo and Swedeland, Pa.	10.50		45.50	30.50	13.00
Chippewa, Pa.	6.00		78.67	1.33	
Higgle Springs, Vt.	6.00		85	2	8.00
Hot Springs, N. C.	3.00	4.50			
Hyndman, Pa.	5.00	8.50	80.23	2.87	
Lime Kiln, Md.	8.00				
Lime Ridge, Pa.	6.00@7.50		80.56-62.71	3.87-1.96	10.75
Newburgh, N. Y.			57	38	8.00
Paxtang and Lemoyne, Pa.	5.50		63	3	
Rockland, Maine		8.00	65	1	
Rosendale, N. Y.	7.00		84	7	6.00
Texas, Md.		9.00			
Union Bridge, Md.	11.00	5.50	73	1	13.00
Williamsport, Pa.	6.00	10.00	75	3	10.00
West Rutland, Vt.	4.50	7.50	68	3	
West Stockbridge, Mass.			57	33	15.00
Williams and Blue Bell, Pa.		8.25	57	33	11.25
York, Pa.	8.50		95	3	12.00
CENTRAL:					
Alton and Hannibal, Ill.	11.50		.95		
Delaware, O.			50.0	5-12	10.00
East Sparta, O.			42	62	10.00
Knowles and Valders, Wis.	5.00	9.00	55	45	12.50
Marblehead, O.			85.10	12.92	12.00
Mitchell, Ind.	5.50	8.50			12.50
Sheboygan, Wis.			58	40.5	
Woodville, Ohio			49.16	32.43	11.50
SOUTHERN:					
Burns, Tenn.	9.50		96	0.54	12.00
Claremont, Va. (Marl.)	5.00	7.00	85-95	2-5	
Dittlinger, Texas		9.00@11.00	98.62	0.29 12.50@15.00	
Erin, Tenn.	9.50		97.82	0.12	
Karo, Va.	9.00		97	1.25	
Knoxville, Tenn.	9.00		98.23		13.00
Staunton, Va.	8.00	10.50	85	10	
WESTERN:					
Colton, Calif.			97	2	15.00
Kirtland, N. Mex.	12.00				
San Francisco, Calif.		15.00	97	0.33	15.00
Tehachapi, Cal.	12.00@15.00	14.00@17.00	98	1.00	

Miscellaneous Sands

(Continued from preceding page)

Rockwood, Mich.	3.25@3.50
St. Marys, Pa.—Green	2.75
Sands, Elk Co., Pa.—Selected, green	2.75
Thavers, Pa.—Washed	2.00@2.50
Tygart, Ky.—Washed, not dried	2.60
Utica, Ill.	1.85@2.25
FOUNDRY SAND:	
Ableman, Wis.—Brass molding and molding fine	3.00
Albany, N. Y.—Glass and sand blast	2.00@7.00
Core	1.40@2.50
Furnace lining	2.50@3.00
Molding fine, coarse and brass	2.50@3.50
Allentown, Pa.—Core	1.50@1.75
Molding coarse	1.50@1.75
Arenville, Ill.—Molding fine	1.70@1.90
Beach City, O.—Core, washed and screened	2.00@2.50
Furnace lining	2.50@3.00
Molding fine and coarse	2.25@2.50
Bowmantown, Pa.—Core	1.35@1.50

Molding, coarse	1.80@2.00
Cleveland, O.—Molding coarse	1.50@2.00
Brass molding	1.50@2.00
Molding fine	1.50@2.00
Core	1.25@1.50
Columbus, O.—Core	.60@2.50
Brass molding	2.50
Sand blast	5.00@5.50
Glass sand	3.00
Molding, fine and coarse	2.00@2.25
Conneaut, O.—Molding fine	2.25@2.50
Molding coarse	2.00@2.25
Delaware, N. J.—Molding fine	2.00
Molding coarse	1.90
Brass Molding	2.15
Dresden, O.—Core	1.50
Molding fine and coarse	1.50@1.75
Brass molding	2.50
Dunbar, Pa.—Glass sand No. 2, damp	3.00
Traction, damp	3.25
Dundee and Chalfants, O.—Core	3.00
Glass, sand blast and traction	3.00
Molding fine, brass molding	3.75
Molding coarse	3.25
Furnace lining	2.75

Miscellaneous Sands

(Continued)

Eau Claire, Wis.—Core	.75@1.25
Sand blast	3.00@4.25
Traction sand	.50
Falls Creek, Pa.—Glass sand, washed	2.50
Core sand, washed or unwashed	2.00
Furnace lining, unwashed	2.00
Molding fine, washed	2.50
Molding coarse, washed or unwashed	2.00
Sand blast, washed	3.50
Stone sawing, washed	2.50
Traction, washed	2.00
Fleetwood, Pa.—Furnace lining	2.25
Franklin, Pa. and Utica, Pa.—Traction	2.50
Brass molding	2.25
Core	1.50@2.50
Molding fine	2.25
Molding coarse	2.50
Sand blast	5.40
Greenville, Ill.—Molding coarse	1.80@2.00
Hellam, Pa.—Core	2.00@2.50
Howard, O.—Glass sand	3.00@3.25
Steel molding	2.25@2.50
Joplin, Mo.—Stone sawing and roofing	1.25
Kansas City, Mo.—Missouri River core	.80
Kasota, Minn.—Molding coarse and stone sawing	1.75
Klondike and Gray Summit, Mo.—Molding fine	2.00@2.50
Molding coarse	2.50@3.00
Mapleton, Pa.—Core, furnace lining, molding fine and coarse damp	2.25
Core, furnace lining, moulding, fine and coarse, dry	3.00
Massillon, O.—Glass sand, molding fine and coarse, core, traction and furnace lining	3.00
Michigan City, Ind.—Core, glass, traction and brass molding	.60
Millington, Ill.—Glass, core, furnace lining, roofing and stone sawing	1.75
Mineral Ridge, O.—Core, molding, sand blast, roofing, etc., washed, screened (damp)	2.75
Montoursville, Pa.—Core and traction	1.50@2.00
Brass molding	1.75@2.25
New Lexington, O.—Molding fine	3.50
Molding coarse	3.25
Oregon, Ill.—Core sand	2.25@3.00
Furnace lining	2.00@2.75
Molding fine, coarse and brass	1.00@1.65
Plaster's molding	2.00
Sand blast	2.25@4.00
Placing sand	3.50
Ottawa, Ill.—Crude silica sand	1.00@1.25
Core, molding, fine and coarse	1.10@2.25
Furnace lining	1.25@2.25
Roofing	2.00@5.00
Sand blast	4.00@5.00
Ottawa, Minn.—Core	2.00@2.50
Glass, molding coarse, roofing, stone sawing (all crude silica)	2.00@2.50
Glass sand, wash	2.25
Ridgeway, Pa.—Glass sand, green	2.50
Molding, fine and coarse	1.20
Rockwood, Mich.—Core	3.00
Roofing, stone sawing	3.50
Sand blast	4.00
Round Top, Md.—Glass sand, core and roofing sand; washed, damp	1.75@2.25
San Francisco, Cal.—Glass and roofing	3.00@3.50
Core, molding fine and brass	2.30@2.50
Furnace lining and molding coarse	3.60@4.50
Thayer, Pa.—Traction	1.75@2.00
Furnace lining	1.10
Molding fine and coarse	1.25
Core, green	1.75@2.00
Tulsa, Okla.—Sand blast	6.50
Tygart, Ky.—Core and stone sawing	2.00
Fire-brick sand, washed but not dried	2.15@2.40
Utica, Ill.—Core and furnace lining	1.25@1.50
Molding, fine and coarse	1.00@1.35
Stone sawing and roofing	1.25@2.25
Sand blast	3.50
Warwick, Ohio—Core, furnace lining, molding fine and coarse (dry)	2.50
Same, green	2.25
Wedron, Ill.—Core (crude silica)	1.00
Molding fine	1.25
Furnace lining	1.25
West Albany, N. Y.—Molding fine	2.25
Molding coarse	2.25
Winnipeg, Man., Can.—Roofing sand	4.00
Zanesville, Ohio—Molding fine and brass	2.00@2.25
Molding coarse	1.75@2.50
Furnace lining	2.50
Steel molding	8.50
Pulverized silica thru 140 mesh	9.50
Thru 200 mesh	9.50

Crushed Gypsum

Blue Rapids, Kan.	3.50
Castalia, O.	3.00
Ft. Dodge, Ia.	3.50@4.50
Grand Rapids, Mich.	4.50
Gypsumville, Man., Can.	4.00
Oakfield, N. Y.	3.50
Gypsum, O.	3.50
Rapid City, S. Dak.	5.00
Saltillo, Va.	4.50
Winnipeg, Man., Can.	5.00

(Gypsum) Land Plaster

Castalia, O.—Jute 3.00; ppr., 1.00.	6.00
Bags extra—Jute 3.00; ppr., 1.00.	7.50
Garhutt, N. Y.—Bags extra	7.50
Grand Rapids, Mich.	7.00@8.00
Mound House, Nev.	7.50
Sacks, 25 extra.	6.00
Oakfield, N. Y.	6.00
Sandusky, O.	12.50
Jute, 3.00 extra; ppr., 1.00 extra.	
Los Angeles, Calif.	

Rock Phosphate**Raw Rock**

Centerville, Tenn.—B.P.L. 72% to 75%	6.00@8.50
B.P.L. 65%	8.00
B.P.L. 70%	9.00@10.00
Gordonsburg, Tenn.—B.P.L. 68%	6.00@7.00
B.P.L. 70%	7.50@8.00
B.P.L. 72%	8.50@9.00
Paris, Idaho.—2,000 lb. mine run,	4.50
B.P.L. 70%	8.00
Wales, Tenn.—B.P.L. 70%	

Ground Rock

Centerville, Tenn.—B.P.L. 70%—	
90% thru 100 mesh	9.00@10.00
B.P.L. 75% (brown rock)	12.00
Mt. Pleasant, Tenn.—B.P.L. 68%	
13% Phosphorus	7.50@9.00
14% Phosphorus	8.00
B.P.L. 65@70%	7.50@9.00
Norwills, Fla.—(Fla. Hard Rock)	
B.P.L. 68%	10.00

Florida Soft Phosphate**Raw Land Pebble**

Per Ton	
Bartow and Norwills, Fla.—B.P.L.	
52%, bulk	6.00
B.P.L. 78%, bulk	13.50
Jacksonville (Fla.) District	10.00@12.00

Ground Land Pebble

Per Ton	
Croon, Fla.—Ground, 30% phos. acid	16.00
Pulverized soft, 26% phos. acid	17.50
Jacksonville (Fla.) District	14.00
Add 2.50 for sacks.	
Morristown, Fla.—24% phos. acid	17.50@20.00
Lakeland, Fla.—B.P.L. 72%	13.50
B.P.L. 60%	6.00

Portland Cement

Current prices per barrel in carload lots, f. o. b. cars, without bags:

New York (del.)	\$3.10
New York, alongside dock, to dealers	2.40
Jersey City (del.)	2.64
Boston	2.87
Chicago	2.17
Pittsburgh	2.17
Cleveland	2.43
Detroit	2.43
Indianapolis	2.43
Toledo	2.49
Milwaukee	2.39
Duluth	2.10
Peoria	2.45
Cedar Rapids	2.51
Davenport	2.47
St. Louis	3.40
San Francisco	3.09
New Orleans	3.36
Minneapolis	2.41
Denver	3.10
Seattle	3.10
Dallas	2.85
Atlanta	3.00
Cincinnati	2.87
Los Angeles	3.21
Baltimore (del.) drayload lots	3.58
Montreal	3.44

NOTE—Bag charge is generally 25c each.

Concrete Brick

Prices given per 1,000 brick, f.o.b. plant or nearest shipping point.

	Common	Face
Bellow Falls, Vt.	25.00	35.00
Bridgeport, Conn.	31.00	32.00
Buffalo, Niagara Falls and Rochester, N. Y.	21.00	
Eau Claire, Wis.	20.00	30.00@40.00
Houston, Tex.		22.00
Lockport, N. Y.	17.00	
Milwaukee, Wis.	17.00@18.00	35.00@65.00
Omaha, Neb.	32.00	42.00
Piqua, O.	18.00	25.00
Portland, Ore.	25.00	43.00@73.00
Fancy brick	100.00@150.00	
St. Paul, Minn.	18.00	20.00@25.00
Springfield, Ill.	18.00	
Tonawanda, N. Y.	20.00	

Roofing Slate

The following prices are per square (100 sq. ft.) for Pennsylvania Blue-Gray Roofing Slate, f.o.b. cars quarries:

Sizes	Genuine Bangor, Washington Big Bed, Franklin	Genuine Albion	Slatington Small Bed	Genuine Bangor Ribbon
24x12	\$ 9.30	\$8.40	\$8.10	\$8.10
24x14	9.30	8.40	8.10	8.10
22x12	10.72	8.70	8.77	9.10
22x11	10.72	8.70	8.77	9.10
20x12	10.72	8.70	8.77	9.10
20x10	11.70	9.60	9.42	9.42
18x10	11.70	9.60	9.42	9.42
18x 9	11.70	9.60	9.42	9.42
16x10	11.70	9.60	9.42	9.42
16x 9	11.70	9.60	9.42	9.42
16x 8	11.70	9.60	9.42	9.42
18x12	11.05	9.30	9.10	9.10
16x12	11.05	9.30	9.10	9.10
14x10	11.05	9.30	8.77	8.77
14x 8	11.05	9.30	8.77	8.77
14x7 to 12x6	10.40	9.00	8.45	9.00
24x12	\$ 8.10	\$7.50	\$7.50	\$5.75
22x11	9.10	7.75	7.75	5.75
Other sizes	9.10	8.10	8.45	5.75

For less than carload lots of 20 squares or under, 10% additional charge will be made.

The following are the prices per square for slate, f.o.b. cars quarries, Granville, N. Y., the prices given in each case being for No. 1 Sea Green Roofing Slate:

22x11, 20x12, 20x11, 20x10, 18x12, 18x10,	
18x9, 16x12, 16x10	10.20
24x12, 22x12, 16x9, 16x8, 14x12, 14x10	9.90
26x14, 24x14, 22x14, 20x14	9.60
14x9, 14x8, 12x10	9.00
14x7, 12x9, 12x8	8.70
12x7, 11x8, 11x7, 10x8	7.50
12x6, 10x7	7.20

Granulated slate per net ton, f. o. b. quarries, Vermont and New York, 7.50.

Lime

Warehouse prices, carload lots at principal cities.

	Hydrate per Ton	Common
New York	Finished \$21.00	\$20.00
Chicago	20.00	20.00
St. Louis	26.00	26.00
Boston	29.00	26.00
Dallas		25.00
Cincinnati	17.60	16.60
San Francisco	25.40	22.00
Minneapolis	29.00 (white)	22.00
Denver (bbl.)		3.20
Detroit	22.00	19.00
Seattle	27.00	
Los Angeles	30.00	30.00
Baltimore	22.25	17.50
Montreal	32.00	
Atlanta		18.00
New Orleans		22.50
	Lumper per 200-lb. Barrel	
	Finished Common	
New York	\$ 3.50 at plant	\$ 3.30*
Chicago		1.75
St. Louis		4.12
Boston		3.55
Dallas		2.50†
Cincinnati		13.10†
San Francisco		2.25
Minneapolis		1.70
Denver		1.00 (bu.)
Detroit		2.00†
Seattle		3.25
Los Angeles		3.00*
Baltimore		12.75†
Montreal		16.00†
Atlanta		2.00
New Orleans		2.40

* 300-lb. barrels. † Per 180-lb. barrel. ‡ Per ton.
NOTE—Refund of 10c per barrel.

Talc

Prices given are per ton f. o. b. (in carload lots only) producing plant, or nearest shipping point.

Baltimore, Md.—Crude talc	4.00
Cubes	50.00
Blanks, per lb.	.07
Biltmore, N. C.—Ground talc (150-200 mesh), 200-lb. bags	15.00@30.00
Pencils and steel workers' crayons, per gross, 1.25@1.45 and	1.55@ 1.60
School crayons, per gross	1.15@ 1.20
Roller mill crayons, per gross	1.75@ 1.90
Chatsworth, Ga.—Crude talc	8.00@10.00
Ground talc (150-200 mesh), bags	12.50
Pencils and steel workers' crayons, per gross	1.50@ 2.00
Chester, Vt.—Ground talc (150-200 mesh), bulk, 10.50@12.00; bags	12.00@14.00

Emeryville, N. Y.—Crude Talc	4.00
Glendale, Calif.—Ground talc (150-200-mesh)	16.00@30.00

(Bags extra)	
Gouverneur, N. Y.—Crude talc	4.00
Ground talc (150-300 mesh)	17.00@24.00
Henry, Va.—Crude talc (lump mine run), per 2000-lb. ton	3.00@ 3.25
Ground talc (20-50 mesh), bags	8.50@ 9.00
Ground talc (150-200 mesh), bags	11.00@13.50
Johnson, Vt.—Ground talc (20-50 mesh), bulk	8.50

(Bags extra)	
Ground talc (150-200 mesh), bulk	10.00@20.00
(Bags extra)	
Keeler, Calif.—Ground talc (200-300 mesh), bags	18.75@32.00

(Bags extra)	
Los Angeles, Calif.—Ground talc (20-50 mesh) 200-lb. bags	12.00
Ground talc (150-200 mesh) 200-lb. bags	20.00

Natural Bridge, N. Y.—Ground talc (150-200 mesh) bags	12.00@18.00
Rochester and East Granville, Vt.—Ground talc (20-50 mesh), bulk	8.50@10.00

(Bags extra)	
Ground talc (150-200 mesh), bulk	10.00@22.00
(Bags extra)	
Waterbury, Vt.—Ground talc (20-50 mesh), bulk	8.50

(Bags extra)	
Ground talc (150-200 mesh), bulk, 10@15.00 and	10.00@15.00
(Bags extra)	
Pencils and steel workers' crayons, per gross	1.20@ 2.00

Sand-Lime Brick

Prices given per 1,000 brick f. o. b. plant or nearest shipping point, unless otherwise noted.

Albany, Ga.	13.00@14.00
Barton, Wis.	18.00
Bloomfield, Ont., Can.	18.00
Boise, Idaho (in yard)	18.00
Boston, Mass.	18.00@19.00
Brighton, N. Y.	19.50
Buffalo, N. Y.	16.50
El Paso, Texas	14.00
Gary, Ind.	11.50@12.00
Grand Rapids, Mich.	15.00
Lancaster, N. Y.	16.50
Michigan City, Ind.	12.00
Milwaukee, Wis. (delivered at job)	17.50
Minneapolis, Minn.	13.00
Plant City, Fla.	17.00
Portage, Wis.—Common	15.00@25.00
Face	35.00
Rochester, Mich.	13.00
Saginaw, Mich.	14.75
San Antonio, Texas—Common	18.00
Face	25.00
South Dayton, Ohio	16.50
Syracuse, N. Y. (delivered at job)	20.00
F. o. b. cars, plant	16.00
Toronto, Can.	17.00
Washington, D. C.	14.50
Winnipeg, Can. (less \$1 trade disc.)	19.00

Natural Cement

Current price for 500 bbl. or over, f.o.b., exclusive of bags:

Minneapolis (Rosendale)	\$2.80
Kansas City (Ft. Scott)	1.60
New Orleans	3.36
Atlanta (Magnolia)—ton	11.00
Boston (Rosendale)	2.35
Cincinnati (Louisville)	2.75



News of the Industry



Incorporations

The Queenston Quarries, Ltd., St. David's Ont., has been incorporated for \$250,000.

The Charlesbourg Granite Co., Ltd., Quebec, Can., has been incorporated for \$20,000.

The Miller Lumber Co., 671 Broad St., Newark, N. J., has been incorporated for \$100,000.

The Sand and Gravel Corp., Atlantic City, N. J., has been incorporated for \$100,000.

The Granite Island Quarries, Ltd., 16th Avenue and Main St., Vancouver, Can., has been incorporated for \$25,000.

The Tri-State Marble & Tile Co., Minneapolis, Minn., has been incorporated for \$25,000 by Wm. H. Dahn and others.

The Concrete Device Mfg. Co., Kansas City, Mo., has been incorporated for \$2,000 by Miller, Cormack and Winger.

The Consolidated Sand Co., Ltd., Montreal, Can., has been incorporated for \$380,000, to deal in sand, gravel and stone.

The Continental Rock Asphalt Sales Co., Fidelity Trust Bldg., Kansas City, Mo., has been incorporated for \$100,000.

The Lawton Concrete Brick Co., Lawton, Okla., has been incorporated for \$5,000 by L. H. and H. Ensley and S. Sprague.

The Athens Brick, Lime and Cement Co., Manhattan, N. Y., has been incorporated for \$10,000 by C. and J. and J. Mayone.

The Hewlett Co., Bridgeport, Conn., has been incorporated for \$100,000 by G. T. Hewlett and others to deal in building materials.

The L. B. Nelson Monument Co., Houston, Tex., has been incorporated for \$5,000 by J. B. Nelson, Phil Stillman and M. Wagner.

The F. A. Barone Construction Co., Hartford, Conn., has been incorporated for \$25,000 by F. A. Barone, 8 E. Greenfield Ave., and others.

The Texas-McCracken Concrete Pipe Co., Dallas, Tex., has been incorporated for \$50,000 by C. R. Nichols, B. Fell and N. E. Johnson.

The Atlantic Gypsum Co., Philadelphia, Pa., has been incorporated for \$50,000 by M. K. Armstrong, Jas. H. Prentiss and L. B. Robbins.

The Western Sand and Gravel Co., Wichita Falls, Tex., has been incorporated for \$100,000 by J. C. Jopling, J. A. Bobo and J. Y. Holbrook.

J. C. Burwell, Inc., Winchester, Conn., has been incorporated for \$60,000 by J. C. Burwell, 38 Depot St., Winsted, and others to deal in lumber.

The Silver Dyke Mining Co., Portland, Me., has been incorporated for \$500,000 by H. P. Sweetser, president and clerk, and T. F. Sullivan, treasurer.

The Pompton Sand and Gravel Co., 125 Prospect St., Passaic, N. J., has been incorporated for \$50,000 by C. E. McDowell, M. John Kane and Edward E. Dyer.

F. R. Upton, Inc., Newark, N. J., has been incorporated for \$10,000 by Lucy Upton, August Boch, Jr., and N. S. Fried. The company will deal in stone and gravel.

The Madeline Gravel Co., Bennettsville, S. C., has been incorporated for \$5,000 by J. J. Heckhart, president; George W. Dudley, secretary, and B. M. Edwards, treasurer.

The Industrial Service and Engineering Co., Boston, Mass., has been incorporated by A. W. Payne, president; E. B. Yates, 50 Congress St., Boston, treasurer and Wm. M. Ferris, Jr.

The Samuel Miller & Co., Inc., Wilmington, Del., has been incorporated for \$75,000 by C. T. Cohoe, C. B. Outten and S. L. Mackey, all of Wilmington. The company will deal in stone.

The Concrete Block and Cement Co., Morgantown, W. Va., has been incorporated for \$25,000 by J. B. Noud, Florence Noud, R. P. Posten, C. G. Baker and C. T. Posten, all of Morgantown.

The Ludlow Sand and Gravel Co., Springfield, Mass., has been incorporated for \$20,000 by Chas. H. Wright, president; John J. Toole, 43 Plymouth St., Springfield, treasurer and R. J. Powers.

The Gunite Company of Canada, Ltd., Hamilton, Can., has been incorporated for \$100,000 by W. E. Janney, president, and A. V. Farley, vice-president. The company will manufacture concrete products.

The Hibbing Concrete Products Co., Hibbing, Minn., has been incorporated for \$50,000 by E. W. Coons, president; C. A. Belanger, vice-president, and W. C. Cohoe, secretary-treasurer. The company will operate sand and gravel plants and manufacture concrete products.

Sand and Gravel

The Liberty Sand and Gravel Co., Annapolis, Md., has gone into bankruptcy.

The Pittsburgh Sand and Gravel Co., Joplin, Mo., will effect an increase in production on opening their new plant. About 65 more men will be employed working night and day in three 8-hr. shifts.

The Madeline Gravel Co., Bennettsville, S. C., recently incorporated, is planning for operations on a tract of property recently acquired, totaling about 100 acres. Machinery will be installed for an initial output of about 150 yards of sand and gravel. B. M. Edwards is manager.

The Arrow Sand Co., Columbus, O., has recently acquired a tract of land near the Scioto River close to Columbus comprising eighty-two acres. A modern plant is to be erected of 1000 tons daily capacity. The firm has been incorporated for \$150,000 with S. Neal Hallock as president.

Sand and gravel men are now fairly active along the Wabash river and the little Wabash river and a fairly busy season is anticipated. The Grayville Sand and Gravel Co., Grayville, Ill., has secured considerable new equipment and is now better prepared for business than formerly. The company operating at Shawneetown, Ill., has also secured some new equipment.

The Daltex Gravel Co., 406 Deere Building, Dallas, Tex., recently organized with a capital of \$50,000, is planning for extensive sand and gravel operations on a tract of land in this section. The company's holdings total about 80 acres, and it is proposed to install equipment to provide for an output of about 300 yards of sand and gravel per day. Patrick C. Miller is president and manager.

The MacGrath Sand and Gravel Co., Lincoln, Ill., has opened sales offices in Springfield and Bloomington. The company is operating four plants located at Forreston, Mackinaw, Pekin and Chillicothe. Paul Coogan, traveling salesman for the company, is in charge of the Bloomington office. Charles L. Luker, a former assistant traffic manager for the Rockford Shippers' and Manufacturers' office is to be in charge of the Springfield office.

The Keystone Gravel Co., Dayton, O., has retained the engineering department of the Greenville Gravel Co., Greenville, O., to design a 1000-yard sand and gravel washing and crushing plant to be equipped with a bin capacity of 2100 tons. Excavating will be done by a pumping dredge and pipe line to a belt conveyor. The plant is located on the B. & O. near the city limits and can serve both rail and truck trade. Large storage facilities are to be added later.

Quarries

The Windsor Asbestos Co., of Ontario has increased its capitalization from \$600,000 to \$2,000,000.

The Eureka Flint and Spar Co. of New Jersey has obtained a license to mine feldspar in Ontario with a capital of \$40,000. G. H. Smythe is attorney for the company.

The Wheeling Feldspar Co. of West Virginia has obtained a license to operate in Ontario with a capital of \$50,000. A. J. Linton, Burkes Falls, is attorney for the company.

The Baker Co., Martinsville, W. Va., operating local stone quarries, has arranged for an immediate reduction in wages from \$3.25 to \$2.50 a day, for a 10-hour working day.

The asbestos industry of Quebec may be put under government control. Quebec now furnishes 85 per cent of the asbestos of the world, but little is manufactured in Quebec.

The County Highway Department has completed the installation of a crusher at Ellison Springs near Gorman, Texas, which will be used for crushing stone for the roads and bridges in that section of the county.

The Rock Products Company's new plant at Shutts, La., has started operating with a force of about 40 men.

The McIntyre Granite Quarries and Mfrs., Ltd., Winnipeg, Man., has increased its capitalization from \$60,000 to \$250,000.

C. C. Beam of Melvin, O., has recently installed a large crusher and a 100-horsepower crude oil burner in his stone quarry.

John N. Fellows, Columbia, Mo., has purchased a new crusher for his quarry and will install it as soon as weather conditions permit.

John T. Henderson, 1003 Main Street, Hartford, Conn., has been appointed trustee in bankruptcy for the Suffield-Berlin Trap Rock Co.

The Walker Cut Stone Co., Tacoma, Wash., has purchased about two acres of land and proposes to install additional machinery for cutting stone.

The Milford Sand and Gravel Co., Milford, Ga., has resumed operations at its plant south of Milford. This plant has a capacity of about 40 cars per day.

The Monroe Paving Co., Shamokin, Pa., are installing a new No. 6 Gearless Standard Crusher (made by Kennedy-Van Saun Engineering and Manufacturing Co.) in their plant.

The Levy Stone Co., Scranton, Pa., recently organized with a capital of \$50,000, is planning for the operation of local stone properties. J. D. Levy, Wilkes-Barre, Pa., is treasurer.

The Marion Stone Co., Marion, O., has been purchased by W. J. Glenn of Kenton, and E. G. Holzhauser of Sandusky, O. The new firm's name will be the "Marion Blue Limestone Co."

The Black Diamond Quarries, Nelson, Colo., have started operating. The granite operations at Salida and Buena Vista are continually increasing the quantity of stone turned out.

The Asbestos Crude Fibre Mining Corp., Black Lake, Can., has let a contract for the construction of a reducing mill for \$52,000. W. Jacobson, manager and engineer, is in the market for crushers, cycles, screens, conveyors, etc.

The Beaver Dam Marble Corporation, 65 Gunther Building, Baltimore, Md., recently organized with a capital of \$100,000, will operate stone and marble quarries in this section. The company is headed by J. Clark Matthai and Edwin H. Brownley.

The Maple Grove Granite quarry formerly known as Perry quarry, Pine Hill, Newport, Vt., has been sold for a reported price of \$8,500 by George Somerville. The new owners will install a modern plant for manufacturing both crushed and facing stone.

Limestone testing over 91 per cent calcium carbonate has been found in Lewis County, Mo., by C. W. Vetter, county agricultural agent. The farm bureau will probably arrange for community organizations to purchase stone crushing machinery to crush the stone for agricultural use.

The Duck-Run Limestone Co., Ellwood City, Pa., has begun operations after extensive repairs on its plant. The plant is now turning out a large amount of limestone for fertilizer purposes. During the period of inactivity new equipment was added and the output of the plant increased.

The Delaware River Quarry & Construction Co., Lambertville, N. J., has perfected plans for the immediate construction of a new stone quarry at Gilboa, near Lambertville. It is proposed to have the plant ready for service at an early date, bringing the company's output up to a total of 70 cars of crushed stone per day. The company is also rebuilding its rock-crushing plant in the vicinity of Glen Moore, N. J., recently destroyed by fire. The company is furnishing considerable quantities of material to the Pennsylvania Railroad of ballast purposes, as well as to county and municipal interests for road construction work. Robert A. Montgomery is president of the company.

Gypsum Products

The Kern County Gypsum Co., McKittrick, Calif., has resumed operations and are prepared to fill all orders for either fertilizer or building work.

The United States Gypsum Co. plans to begin the construction of its proposed plant at Sweetwater, Tex., shortly. The plant will give employment to about 700 men when operating.

The American Gypsum Co., Port Clinton, O., has announced through its general manager, F. J. Griswold, that the plant will be kept in operation for the next 60 days, if possible. It will operate on part time, thus giving employment to as many men as possible.

The Laramie Cement Plaster Co., Laramie, Wyo., has its new plant nearly completed and will soon be ready for operation. This is a modern plant and one of the foremost in that section of the country. Mr. Patchell is president and B. F. Bickel, general manager of the new concern.

Cement

A cement plant located near Monterey, Mexico, which has been closed since 1914, is now rehabilitating its plant preparatory to resumption of operations.

The cement plant at Gold Hill, Ore., has resumed operations after undergoing extensive repairs and additions whereby the daily output has been increased 200 bbls.

The Cape Girardeau Portland Cement Co., Cape Girardeau, Mo., has been making repairs on its plant with the object of starting full operations soon according to Arthur Harrison, secretary of the company.

The Marquette Cement Mfg. Co., La Salle, Ill., have installed three new 42-in. Fuller Mills in their coal grinding department. This concern has now 18 of these mills operating in the raw department and six in the coal department.

The Carolina Portland Cement Co., Jacksonville, Fla., is planning for the erection of a new building at First Street and Railroad Avenue to cost about \$20,000. It will be used as a cement warehouse. W. E. Law is manager.

The International Cement Corp., with plants located in Uruguay, Argentina, Cuba, and the United States, has announced the following earnings for 1920: Sales, less discount, etc., were \$4,492,624; manufacturing profits, \$1,056,892; gross profit after general expenses, etc., \$670,169; net profit, \$743,038; balance after interest taxes, etc., \$317,603.

Concrete Products

The Hudson Cement & Supply Co., Westwood and Whitmore Avenues, Baltimore, Md., has increased its capital stock to \$500,000.

The Standard Poured Brick Co., Miami, Fla., recently formed with a capital of \$100,000, will operate a local plant for the manufacture of concrete brick. L. R. Nordquist is president and J. L. Holmberg, secretary and treasurer.

Thomas Russo, of Hayward Place, Wallington, N. J., is having a concrete block manufacturing plant built on Patterson Ave., E. Rutherford. He intends to dig a sandpit near the plant in order to get sand for making the blocks.

The Virden Builders Supply Co., Virden, Ill., reports that business is good in that section of Illinois. The company manufactures concrete blocks and brick and are working at full capacity. They plan on enlarging their plant soon.

The Silver Hill Sand & Cement Products Co., Silver Hill, Md., recently incorporated with a capital of \$25,000, has plans under way for the erection of its proposed new plant to consist of a number of one-story buildings. The new works will specialize in the manufacture of roofing tile and other concrete products, and considerable machinery for manufacture will be installed. John Campbell is president; Frank Bell is manager.

Slag

The Lehigh Slag Co., Catasauqua, Pa., recently organized with a capital of \$50,000, will operate a local plant. A. F. Kostenbader, Catasauqua, is treasurer.

The New England Slag Co., East Canaan, Conn., is having plans prepared for a new crushing plant. Buck and Sheldon, architects and engineers, are designing the plant. A special drying machine for separating the fine material is a feature of the design.

Phosphate

Phosphate nodules 40 ft. below the earth's surface and of considerable size have been located near La Costa, Texas. The deposit will be tested for phosphate content.

The Downing Phosphate Co., Bartow, Fla., has issued a very interesting booklet on "Phosphate" containing extracts from various sources on the value of phosphate as a fertilizer.

The Big Pine Fertilizer Co., Big Pine, Calif., has recently purchased 1500 acres of land east of Big Pine containing valuable phosphate deposits. It is understood that 100,000 tons of the material is to be shipped to Japan at an early date.

The Soda Mining and Products Co., Vancouver, B. C., is building a plant at Soda Lake near 70 Mile House for the evaporation of soda from the lake. The product will be taken by rail to Squamish and thence by scows to Vancouver.

Lime

The Dominion White Lime Co., 240 Pitt St., Windsor, Can., will erect a chemical lime factory, kilns and office at an estimated cost of \$25,000. J. Becker is general manager and secretary.

The Massachusetts Lime & Cement Co., Cambridge, Mass., is erecting a new warehouse at 400 Portland Street, East Cambridge. They invite builders to inspect this work as it is being constructed from a new 8x8x16-block of the same texture and appearance as face brick. The company deals in building materials.

Personals

M. W. Hall, formerly of New Jersey, has assumed the management of the Arkansas Crushed Stone Co. plant in Libby Spur, Ark.

H. M. Hess, formerly chief chemist of the Monarch Cement Co., Humboldt, Kan., is now with the Edmonton Portland Cement Co., Edmonton, Alberta, Can., as chief chemist.

Charles L. Talkington, formerly superintendent of the Indiana State Farm at Putnamville, Ind., has accepted the position as superintendent of the Black Hills cement mills at Black Hills, South Dakota.

Victor T. Goggin, late New England sales manager of Fred T. Ley & Co., Inc., of Springfield, Boston and New York, has severed his connection with that concern to associate himself as contracting engineer with Dwight P. Robinson & Co., Inc., of New York, Chicago, Dallas, Youngstown, Los Angeles and Montreal.

W. J. Young, chief engineer and general superintendent for the Alpha Portland Cement Co., Easton, Pa., has resigned to accept a position as chief engineer for the Standard Lime and Stone Co. and the Washington Lime Co., of Baltimore, Md. Both of these companies are controlled by the same interests. Mr. Young, who took up his new duties on April 1, has been with the Alpha company since 1907.

B. J. Latimer resigned as chief engineer for the Southwestern Portland Cement Co., El Paso, Tex., to accept the position of superintendent of the Nebraska Cement Co., Superior, Neb. Mr. Latimer has been assistant superintendent and chief engineer for the Southwestern company for the last four years and has just completed the design, construction and installation of a 2200 horsepower waste boiler plant at that place.

Under the terms of a co-operative agreement effected between the National Safety Council and the United States Bureau of Mines, C. L. Colburn, who has served as Assistant Chief Mining Engineer of the Bureau of Mines for the last two years, has been given the duty of visiting the various coal and metal mines of the country for the purpose of acquainting the operating companies with the scope of the technical safety service available to them through this co-operation. Mr. Colburn's work will be under the general direction of B. F. Tillson, Chairman, of the Mining Section of the National Safety Council, who also acts as Consulting Mining Engineer of the Bureau of Mines.

Retail Dealers

The Oscar A. Anderson Co., Palmyra, Wis., has reduced its capitalization from \$350,000 to \$200,000. The company deals in building materials of all kinds.

The West Jersey Sand & Supply Co., 419 Market Street, Camden, N. J., has filed notice of increase in capital from \$10,000 to \$250,000 for proposed expansion.

J. B. Farwell & Co., Oswego, N. Y., has been appointed local agent for the Concrete Steel Co., of New York, manufacturers of Havemeyer Bars and Concrete Products. Mr. Guy L. Noble, formerly Division Engineer on the Barge Canal and who had charge of the Terminal construction here, is State Sales Manager, with offices in Syracuse.

The County Council of Vanderburgh County, Ind., has approved a road-building program that will mean the expenditure of \$750,000 on improved roads in the county during the coming year. The roads will be built under the supervision of the Indiana State Highway Commission, and it is expected that actual construction will start within a short time.

Manufacturers

The Bradley Pulverizer Co., Allentown, Pa., has just issued Catalog 45, "The Improved Griffin Mill" which describes the Giant and Junior Griffin mill pulverizers.

The Lima Locomotive Works, Inc., has moved its executive and sales offices from 30 Church Street to the National City Building, 17 East Forty-second Street, New York City.

The Fuller Engineering Co., Allentown, Pa., has just issued catalogue No. 700 entitled "Fuller Pulverized Coal Equipment for Locomotives." It contains very interesting information on the use of this fuel for locomotives as well as the details of equipment installation.

The Charles Warner Co., Wilmington, Del., has declared its regular quarterly dividend on the first and second preferred capital stock of \$1.75 a share. A dividend of 50 cents a share and an extra dividend of 25 cents a share on the common capital stock has also been declared.

The Brown Hoisting Machinery Co. of Cleveland, Ohio, announces the opening of a southern office, to be located at 530 Whitney-Central Building, New Orleans. The states of Texas, Louisiana, Mississippi, Alabama, Georgia and Florida will be covered from this office. Charles H. White is the manager of the new office.

The Austin Machinery Corp. plant at Winthrop Harbor, Ill., suffered a fire loss on March 22nd, which will not, according to officials, in any way interfere with production and prompt delivery of Austin Trenching Machines, Backfillers, Building Mixers, Pavers, Draglines and Shovels, as practically all lines of Austin machinery are also being built at the plants at Muskegon, Michigan, as well as at the former plant of the Toledo Bridge & Crane Co. at Toledo, Ohio. The Austin Machinery Corp. advise they have on hand in Muskegon and at Toledo ample stocks of Wagon Loaders, the popular sizes of Trenching Machines, Backfillers, Mixers, Pavers, and 1/2-yard and 3/4-yard Draglines and Shovels, and that a new lot of 1-yard Shovels and Draglines are now coming through the Toledo plant. The extensive operations of this corporation, however, in the building of construction, contractors' and public service machinery, make it advisable to rebuild the Winthrop Harbor plant, as the location of this plant particularly facilitates production for the West and Northwest territory. The Austin Corporation has recently consolidated into its group the plant of the Fairmont Mining Machinery Co. at Fairmont, W. Virginia, and extensive improvements there are planned.

OBITUARY

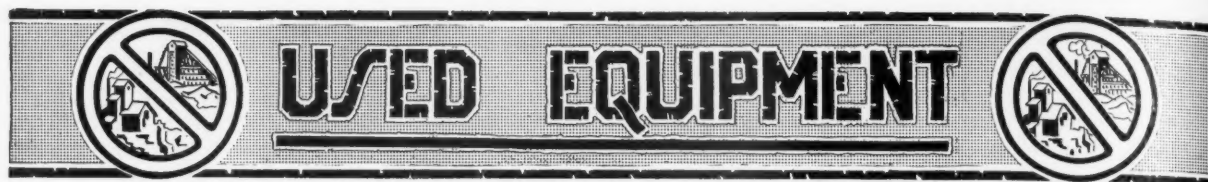
J. M. Campbell, formerly manager of the Alberta Portland Cement Co., Calgary, Alberta, died recently at Hollywood, Calif.

Wm. R. Goodall, 64 years old, died at his home in Bedford, Ind., Feb. 25, following an illness of several months. He was widely known among stone men of the southern part of the state, having been supervisor of stone quarry operations for several years. He was active in the Masonic order and is survived by a widow and three brothers.

Charles W. Capelle, 60 years old, for the past several years secretary and treasurer of the Caden Stone Co., Evansville, Ind., died at a local hospital on Tuesday, March 15th, following an operation. He was well and favorably known to the trade in Southern Indiana, Southern Illinois and Northern Kentucky. He is survived by his wife, one son and one daughter.

H. Kirke Porter, Pittsburgh's pioneer locomotive builder, president of H. K. Porter Co., former member of Congress and for many years active in industrial and civic movements, died April 10th, aged 81, in his residence, 1600 I Street, Washington, D. C. Mr. Porter was stricken two weeks ago while at his winter home in Jekyll Island, Georgia, with heart disease and was later taken to his Washington home.

Thomas J. Dunphy, superintendent of the Granite Quarries Co. and for 25 years secretary and treasurer of the Granite Manufacturers' Association died of pneumonia recently at his home, 27 Elm Avenue, Quincy, Mass. He was widely known in the granite trade throughout New England, and was a member of Quincy Lodge of Elks, St. Francis court, M. C. O. F., and the Granite City Club. A widow and one son survive him.



Rates for advertising in the Used Equipment Department: \$2.50 per column inch per insertion. Minimum charge, \$2.50. please send check with your order. These ads must be paid in advance of insertion.

Repaired Contractors' Equipment

Steam Shovels

Model 60 Marion Shovels, 2½-yard dippers, Nos. 1999, 2059, 2130

1—Model 1 Thew, on railroad trucks, ¾-yard dipper.

1—Bucyrus Model 70-C, Shop No. 1219.

2—Model 28 Marion Revolving, ⅝-yard dippers.

1—Model O Thew Revolving, ½-yard dippers.

1—Type "B" Erie Revolving, ¾-yard dippers.

We have a large stock of thoroughly repaired Construction Equipment of all kinds ready for immediate shipment.

Locomotives

8—18-ton, 10x16" Porter Dinkeys, 36" gauge.

2—12-ton, 9x14" Porter Dinkeys, 36" gauge.

1—17x24", 55-ton, 4-6-0, standard gauge.

3—25-ton Forney type.

Clam Shell Buckets

1—1¼-yard Williams Hercules Bucket.

Cars

30—Western Air Dump 12-yard, standard gauge.

40—Western 4-yard, 36" gauge, steel beam.

H. KLEINHANS COMPANY

Union Arcade

Pittsburgh, Pa.

NO. 8-D, GATES GYRATORY CRUSHER

STANDARD DRIVE

Fitted with manganese head and concaves. Included with this crusher, we have the following extra spare parts:

- 1 New, Manganese head.
- 1 New, set of manganese concaves.
- 1 New, main shaft.
- 1 New, Spider, and 2 New, eccentrics.

We also have many other sizes and types. We specialize in good quarry equipment of all classes. Write us fully.

Reading Engineering Co., Inc.
1227 Tribune Bldg., New York, N. Y.

Machinery For Sale

DRYERS—Direct-heat rotary dryers, 3x25', 3½x25', 4x30', 5½x50' 6x50' and 7x60'; double shell rotary dryers, 4x20', 5x30' and 6x35'; steam-heated air rotary dryers, 4x30' and 6x30'.

KILNS—Rotary kilns, 3½x25', 5x60' and 6x70', 6x100', 7x80' and 8x110'.

MILLS—6x8', 6x5', 2½x3' 3x3½' pebble and ball mills; 8x4', 6x4' and 4x4' continuous ball mills; 3' March mill; 42", 33" and 24" Fuller-Lehigh mills; 4½x20', 5x11', 5x20', 5½x22' and 6x20' tube mills; 7½x13", 9x15", 16x10" and 30x60" jaw crushers; one "Infant" No. 00, No. 0, No. 2, No. 3, and No. 9 Williams' swing hammer mills; one Kent type "G" mill; 36" and 40" cage mills; 3' and 4½' Hardinge mills; 18x12", 20x12" and 30x10" roll crushers; No. 0, No. 1 and No. 3 Sturtevant rotary crushers; one No. 2 Sturtevant ring roll crusher; 3 roll and No. 000, No. 00 and No. 0 Raymond mills; one No. 5 Tel-smith breaker; one 36" Sturtevant emery mill; one 3 roll Griffin mill; 60" chaser mill.

SPECIALS—Five automatic package weighing machines; jigs; one keystone excavator; 6x8', 6x5' and 4x3' Newaygo vibrating screens, Richardson automatic scales.

Air compressors and tanks.

W. P. Heineken, Engineer

95 Liberty Street, New York. Tel. Cortland 1841

FOR SALE

1—No. 2, 11x20 Aurora Jaw Crusher, manufactured by Western Wheeled Scraper Company. New Manganese Dies. Rated capacity, 25 tons per hour.

1—No. 18 Universal Crusher Company Pulverizer. Practically new, used less than one week. Rated capacity, 12 tons per hour.

1—Magnetic Separator Pulley. Practically new. Manufactured by Cutler-Hammer Manufacturing Company. 12" diameter for 20" belt, 230 volts, for use with above Pulverizer.

Above machinery in best condition, ready for use, and offered for sale only because being replaced by machines with larger capacity.

Can be inspected at our plant at New Castle, Pa.

Universal Sand Company
New Castle, Pa.

USED EQUIPMENT

Rates for advertising in the Used Equipment Department: \$2.50 per column inch per insertion. Minimum charge, \$2.50. Please send check with your order. These ads must be paid in advance of insertion.

LOCOMOTIVES

- One—68-ton, standard gauge, Baldwin Mogul; 180-lb. pressure.
- One—56-ton, standard gauge, American 10-wheeler; 175-lb. pressure.
- Two—50-ton, standard gauge, Brooks 6-wheel switchers; 160-lb. pressure.
- One—65-ton, standard gauge, Shay Geared Locomotive.
- One—24-ton, standard gauge, Shay Geared Locomotive.
- One—14-ton, 36" gauge, American Saddle Tank.
- Two—23-ton, brand new, 36" gauge, Porter 6-wheel switchers; separate tenders.
- One—Model 14-B Bucyrus Shovel.

The above are only a few items of our stock. Will gladly send you our complete stock lists.

Birmingham Rail & Locomotive Co.
Birmingham, Ala.

IMMEDIATE DELIVERY

No. 4 Gyratory Crushing Plant, N. Y. State
6, 7½, 9 and 18 K Crushers, Reg. Drive

- 2—18 in. and 24 in. Disc Crushers.
- 2—150 H.P. 125 lb. Marine type boilers.
- 2—150 H.P. 125 lb. H.R.T. boilers, buttstrap.
- 4—No. 6 Gates (Mang. Fit.) nickel steel shafts.
- 1—No. 7½ and 1—No. 8 Gates, reg. drive.
- No. 2, 3 and 4 Gates, reg. drive.
- Air Compressor (steam-belt) 50 to 4000 ft.
- 40 Rollers, 60-150 H.P., 100-130 lb.
- 5, 6 and 12 ton 24 in. gauge gasoline locomotives.
- 1—No. 16 Koehring Paver, ½ yd. steam.
- 1—3x3 and 10x10 Air Comp. (belt).
- 2—180 ft. Quick Shift 30 ft. bucket towers.
- 6-8 and 10 SAND PUMPS.
- 50 Kw. 125 V. Dir. Cur. Eng. Set. \$750.
- 5, 10 and 15 ton HOLT TRACTORS, PRAC. NEW.
- NEW 3000 ft. 2 stage Air Comp. and Motor.

Send us your inquiries—Sand Pumps, Motors, Contractors' Equipment, etc.

ROSS POWER EQUIPMENT CO.
Indianapolis, Ind.

WANTED

- 1—Centrifugal Pump, Motor & Base. Direct connected, capacity 4,000 G.P.M. against 150 ft. head.
- 800 ft. 14" Cast iron flanged pipe.
- 1—15" Flexible rubber pipe 16' long.
- 1—14" Flexible rubber pipe 20' long.
- 1—15" Foot valve flanged.
- 2—14" Tate Valves.
- 1—14" Tee.
- 3—14" Ells.
- 1—Reducer 16" to 14".
- 1—Set Crushing Rolls 24" Dia. by 30" length.

KOSMOS PORTLAND CEMENT CO.
Incorporated
LOUISVILLE, KY.

PRODUCERS—Keep your eyes on the Used Equipment pages of

ROCK PRODUCTS

for your requirements of second hand machinery

Machinery Men—Advertise your equipment here for quick turnover

We offer for Immediate Delivery, subject to prior sale, F. O. B. cars Attica, N. Y.

- 1—10 ton, 4 wheel Browning Crane No. 1499. 42 ft. boom. Crane in good condition. Price \$4800.00.
- 1—8 ton Plymouth Gasoline Locomotive, 36 in. gauge, good condition. Price \$1400.00.
- 1—25 hp. Semi-diesel, type Y, special Electric, Fairbanks-Morse Fuel Oil Engine, complete with new firing chamber, used three months, good as new. Price \$600.00.
- 1—50 hp. Rice Automatic Steam Engine, cylinder 9x16, good working condition. Price \$300.00.
- 1—Fuel Oil steel cylinder tank, 24 in. x 10 ft. Capacity 236 gallons. Price \$50.00.

J. E. CARROLL SAND CO.
White Building, Buffalo

FOR SALE

One piece new Goodyear Conveyor Belt, 47 ft. long, 40 in. wide, 6 ply, \$5.00 per lin. ft., with ⅛-in. Rubber Cover on carrying side. This belt is being sold at this price on account of being the wrong size for our use.

DOOLEY BROTHERS

Peoria, Illinois

FOR SALE

One—Westinghouse 780 KVA (625 KW) Turbine Outfit.

One—Westinghouse-Leblanc Condenser.

One—16 KW Exciter Outfit.

All in first class condition. For full particulars address

Phoenix Portland Cement Co.
Nazareth, Pa.

FOR SALE

2 RAYMOND 8-ft. tubular dust collectors complete with 18-ft. cloth tubes. One Brand New. One Used.

Rockland & Rockport Lime Corp., Rockland, Maine

WANTED

Second hand grinding mills, Griffin type preferred; also a good crusher. Address

Box 1475

Care of Rock Products

FOR SALE

Bucyrus Steam Shovel No. 1666 Model 70C. Price \$10,000.00.

Marion Steam Shovel No. 3158 Model 28. Price \$5,200.00.

Marion Steam Shovel No. 3573 Model 28. Price \$5,500.00.

All regular specifications complete. First class working conditions. Operating continually and can be seen in operation. Prices f.o.b. cars Mexico, Mo., and subject to prior sale.

A. P. Green Fire Brick Co.
MEXICO, MISSOURI

"Everything for the Quarry"

- 1—½-yd. Thew "O" Traction Shovel.
- 1—3-ton Davenport Type "D" Caterpillar Crane.
- 1—3-ton Std. Ga. Plymouth Gasoline Locomotive.
- 1—7x12 cyl. 36-in. gauge Porter Saddle Tank.
- 1—9x14 cyl. 36-in. gauge Vulcan Saddle Tank.
- 1—10x16 cyl. 36-in. gauge Davenport Saddle Tank.
- 1—11x16 cyl. 36-in. gauge American Saddle Tank.
- 20—36-in. gauge 4-yd. Western Dump Cars.
- 3—16-yd. Western Air Dump Cars.
- 5—60,000-lb. Cap. Side Dump Ballast Cars.
- RAILS—Track Material—Hoists—Bollers—Derricks—Pile.

ZELNICKER in ST. LOUIS

Big Bulletin 290—Just Out—Get YOUR Copy Now.

Locomotives for Rent or Sale

- 2—50-ton 18x24 in. six-wheel switchers.
- 1—40-ton 17x24 in. four-wheel switcher.
- 1—40-ton Vulcan four-driver saddle-tank.
- 2—18-ton and 14-ton 36-in. gauge Vulcans.
- 2—10-ton 7x12 in. 36-in. gauge Vulcans.
- 1—10-ton 36-in. gauge Shay geared.

Miscellaneous

- 1—Marion 35 steam shovel on traction wheels.
- 1—Marion 76 steam shovel, No. 3503.
- 1—Lidgerwood dragline, 60-ft. boom, 2-yd. bucket.
- 100—60,000-lb. capacity box cars, 40-ft. long.
- 40—60,000-lb. capacity flat cars, 36-ft. long.
- 13—6-yd. dump cars, 4-ft. 8½-in. gauge.
- 12—1½-yd. "V" steel dump cars, 36-in. gauge.
- 1—Western standard gauge spreader.
- 2-in. 4-in. and 6-in. simple, duplex, and centrifugal pumps, 10 H.P. and 45 H.P. upright boilers, tripod drills, etc.

LOCOMOTIVE CRANES, RAILWAY EQUIPMENT, etc.

INDUSTRIAL EQUIPMENT CO.
McCormick Building, Chicago, Ill.

USED EQUIPMENT

Rates for advertising in the Used Equipment Department: \$2.50 per column inch per insertion. Minimum charge, \$2.50. Please send check with your order. These ads must be paid in advance of insertion.

New—RAILS—Relaying

All sections on hand for quick shipment. Reasonable prices quoted. Our stock is very complete.

M. K. FRANK
Frick Building Pittsburgh, Pa.

FOR SALE

2—5'6"x20' Schmidt Tube Mills complete.

For full particulars address

Phoenix Portland Cement Company,
Nazareth, Pa.

FOR SALE

1—36" American Pulverizer.
1—1 yard (new) Riesler clam shell bucket.

Acme Brick Co., Milwaukee, Wis.

ROCK CRUSHING PLANT

Normal capacity 1000 tons 9 hours, practically new and modern in every respect; operating to capacity. Must be sold owing to personal differences in company; can be handled with a small amount of cash and will stand the closest investigation. Location Southwest. Orders enough on hand to run unlimited time.

Box No. 1482 Care of Rock Products

FOR SALE

Unusual Offer

1—No. 5 Austin Gyratory Crusher, weight approximately 32,000 lbs. This machine can be purchased for \$2,000.00, terms spot cash. This price is about 40 per cent of present delivered cost. Can be inspected at B. & O. R. R. siding, Craddock, Upshur Co., W. Va.

Greater Pittsburgh Oil & Gas Co.
1118 Carnegie Building
PITTSBURGH, PA.

CLASSIFIED ADVERTISING

Rates for advertising in the Classified Department: \$2.50 per column inch per insertion. Minimum charge, \$2.50. Please send check with your order. These ads must be paid in advance of insertion.

Positions Wanted

SUPERINTENDENT

With 16 years' experience in mine and quarry work. Have designed and supervised the erection of large crushing plants. Thoroughly familiar with operation of churn drills and blasting. Competent with steam shovels.

Box 1479 Care of Rock Products

POSITION WANTED

By a practical cement superintendent; 15 years' experience. Also familiar and experienced with all quarry operations and construction work. Can furnish A No. 1 reference.

Address Box 1481, Care of Rock Products

Plant for Sale

Plant for Sale

For Sale, Lease or Rent

A modern equipped limestone and pulverizing plant with 30 acres of a 30-ft. ledge of the highest testing blue limestone in southern Ohio. No lack of business, but am retiring on account of my health and age, but will take interest with party that can manage it if necessary. Plant has been in operation five years. Lots of orders ahead for the spring and summer trade. Call on or address

FRANK SHARP, Lynchburg, Ohio

Robert W. Hunt

Jno. J. Cone

D. W. McNaugher

ROBERT W. HUNT & Co.

Inspection—Tests—Consultation

Inspection New and Second Hand Machinery, Pumps, Crushers, Steam Shovels, Cars, Locomotives, Rails and Quarry and Contractors' Equipment

INSPECTION AND TESTS OF SAND, GRAVEL, CEMENT, STRUCTURAL STEEL, CASTINGS AND CONSTRUCTION MATERIALS

Cement, Chemical and Physical Testing Laboratories

CHICAGO
New York St. Louis Kansas City Cincinnati Pittsburgh San Francisco

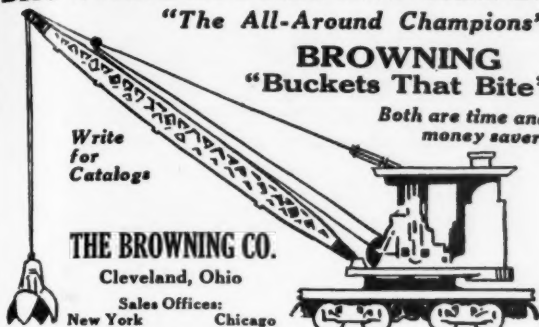
F. L. SMIDTH & CO.
50 CHURCH STREET NEW YORK

Engineers

CEMENT MANUFACTURING PLANTS
CEMENT MAKING MACHINERY
PULVERIZED COAL INSTALLATIONS
GRANULATING AND PULVERIZING
MACHINES FOR ALL MATERIALS
FLINT PEBBLES—SILEX LINING
THE LENIX BELT DRIVE

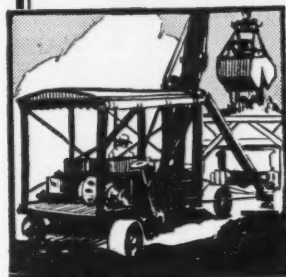
BROWNING LOCOMOTIVE CRANES*"The All-Around Champions"***BROWNING**
"Buckets That Bite"*Both are time and money savers*Write
for
Catalogs**THE BROWNING CO.**

Cleveland, Ohio

Sales Offices:
New York Chicago**"Tie up with" the
Handiest Power**

You can operate your Byers Crane by the power that's cheapest and easiest to get—electricity, steam or gasoline. Two types—"Auto-Crane" and Full-Revolution. Standard mountings. Write for particulars, describing your work fully.

THE BYERS MACHINE CO.
310 Sycamore St., Ravenna, Ohio
Sales Representatives
in 25 Leading Cities

**The Advance Engineering Company**

Cleveland, Ohio

The "ADEN" Crane and Bucket

Special Interest to Sewer Contractors and Special Excavation Problems



E. 140 St. Sewer, Cleveland, O.—34-Yd. Heavy Bucket being used

ARNOLD & WEIGEL

CONTRACTORS AND ENGINEERS

WOODVILLE, OHIO

*Specializing in***The Design of Modern Lime
Calcining and Hydrating Plants****We Design and Equip
Complete Plants**

for the manufacture of gypsum products, such as wall plaster, moulding plaster, wall board products, gypsum block products, also mixing plants.

We are prepared to furnish complete machinery-equipment and design and furnish plans for the installation. Consult our Engineering Department. Forty years' experience in designing of wall plaster machinery and plants.

The J. B. Ehrsam & Sons Mfg. Co.

Engineers, Machinists and Founders

Enterprise, Kansas

**ALDEN, WILTERDING & SCOTT**
CONSULTING ENGINEERSSeven-Sixty Spitzer Building
TOLEDO OHIO**COMPLETE DESIGNS**

Sand and Gravel Plants, Stone Crushing Plants, Conveying and Storage Systems. Hydraulic Dredging and Stripping Plants. Power Plants and Electric Transmission.

WRITE FOR OUR CAR LOADING CHART

James N. Hatch, C.E., M.E.

Member A. S. C. E.

CONSULTING ENGINEER

500 Old Colony Bldg., Chicago

Designs and Constructs

Complete Sand and Gravel Screening and Washing Plants.

Stone Crushing and Storage Plants. Conveying Systems.
Contractors' Material Plants

Electric Generating Plants and Transmission Lines.

Estimates and Plans Furnished

Geo. B. Massey Company
Consulting Engineers**EXCAVATION**

Opening up and economical development of stone quarries, sand, gravel and clay deposits.

Hydraulic Stripping.

Centrifugal pumping and hydraulic dredges.

Most suitable machinery and methods to insure lowest costs.

Design and construction of complete plants.

Engineering supervision.

Inspection of new and second hand machinery.

Booklet on excavating machinery on request**Peoples Gas Building, Chicago**

Robins Conveying Machinery

is handling limestone, clinker, cement in bulk and in bags, gypsum, sand, gravel, crushed stone and many similar materials. Write for a copy of the Robins Handbook of Conveyor Practice and learn more about the Robins System.

Robins Conveying Belt Company Park Row Bldg. New York City

Chicago, Ill., Old Colony Bldg.

Pittsburgh, Pa., Union Arcade Bldg.

San Francisco, Cal.

Birmingham, Ala.

The Griffen Co., Holbrook Bldg.

C. B. Davis Eng

Brown Marx Bldg.

Salt Lake City, Newhouse Building



"Hercules Solid Weld" Steam Shovel Chains



Best In the World. Will Actually Wear Out

The Columbus McKinnon Chain Company
Columbus, Ohio

The House of Dependable Service HYMAN-MICHAELS COMPANY

Peoples Gas Building

CHICAGO

NEW AND RELAYING RAILS

BRANCH OFFICES

New York, N. Y.
1324 Woolworth
Bldg.

Pittsburgh, Pa.
1313 1st National
Bank Bldg.

St. Louis, Mo.
2115 Railway Ex-
change Bldg.

EASTON CARS



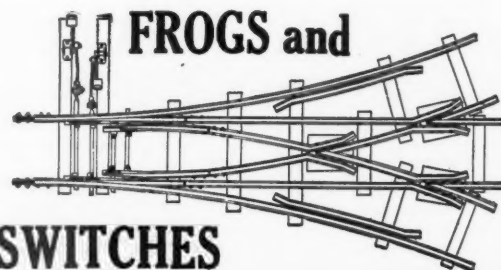
Skip cars for steep inclines, of various designs to meet special requirements. For twenty-five years we have been making all kinds of industrial cars satisfactorily.

Let us help you



49 Dey Street, New York
Boston Chicago Detroit

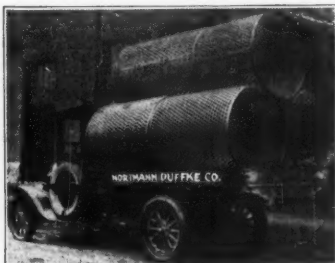
Works: Easton, Pa.
Philadelphia Pittsburgh



SWITCHES

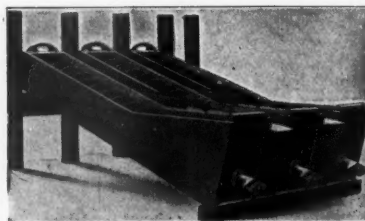
The Central Frog & Switch Co., Cincinnati, O.
Frogs, Switches, Crossings, Switch Stands, Rails, Angle Bars, Fishplates, Throws, Rail Braces, Tie Plates, Portable Track, Etc., Etc.

PERFORATED SCREENS



We have the technical knowledge and the equipment that enables us to meet your most exacting needs quickly.

NORTMANN-DUFFKE CO.
1200 27th Ave.
MILWAUKEE, WIS.



Sand Washers

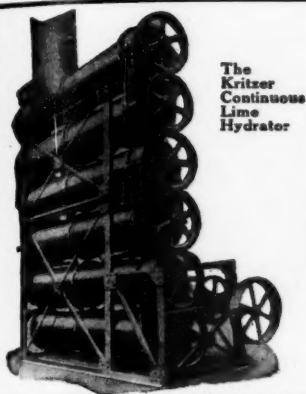


9-Foot Dry Pan

Lewistown Foundry & Machine Co. LEWISTOWN, PA.

Builders of heavy duty crushers and glass sand machinery. Glass sand plants equipped complete.

Write for prices and catalog



The
Kritzer
Continuous
Lime
Hydrator

HYDRATE

Years ago we helped our customers create a demand for their hydrate. Today the demand exceeds the supply. That's why every lime manufacturer should have an efficient, economical hydrating plant.

THE KRITZER Continuous Lime Hydrator is efficient in production and economical in operation and maintenance. Let us investigate exhaustively the local conditions peculiar to your proposition, and then apply our experience of many years and design a plant to meet those conditions.

A KRITZER plant, scientifically adapted to your conditions, will give you the best product at lowest cost

THE KRITZER COMPANY
503 South Jefferson Street CHICAGO, ILL.

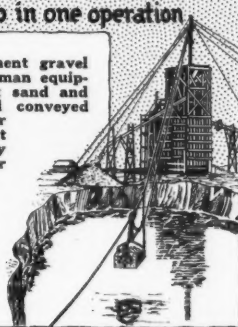
SAUERMAN DRAGLINE CABLEWAY EXCAVATORS

dig, convey, elevate and dump in one operation

Cost data furnished by prominent gravel producers who are using Sauerman equipment backs up our claim that sand and gravel can be excavated and conveyed from pit to plant by one of our drag-line cableway excavators at a lower cost per ton than by using any other equipment or combination of equipment.

Write for Catalog No. 7

Sauerman Bros.
1140 Monadnock Bldg.
Chicago
Also Mfrs. of Power Scrapers



Owen Buckets

combine dollar-saving features of bucket construction which are illustrated in our latest catalogue.

Write for it today.

THE OWEN BUCKET CO.
538 Rockefeller Bldg., Cleveland, Ohio

PERFORATED SCREENS AND STEEL PLATE WORK

W. Toepfer & Sons Co.
Milwaukee Wisconsin

TERRY

FAMOUS
DERRICK IRONS, FITTINGS
AND ERECTORS' TOOLS



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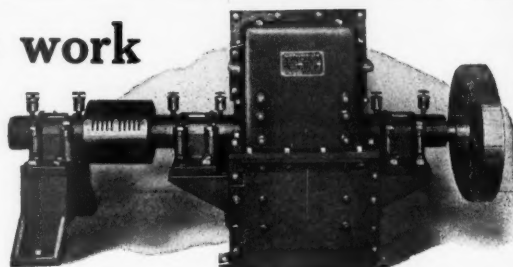
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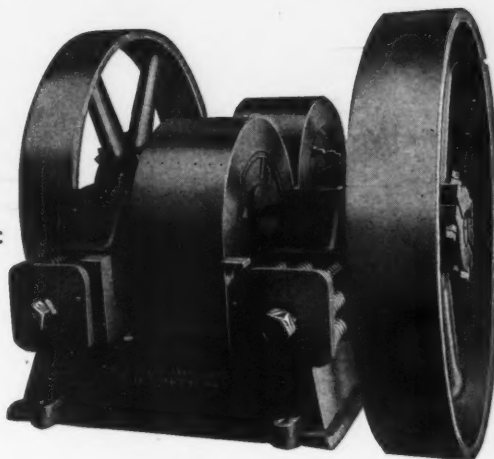
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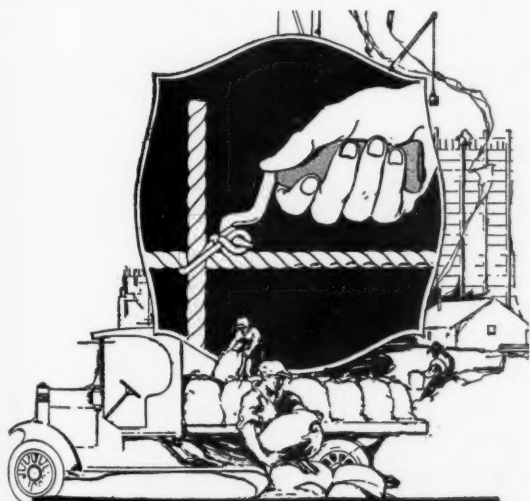
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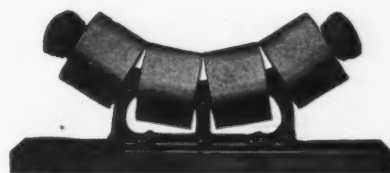
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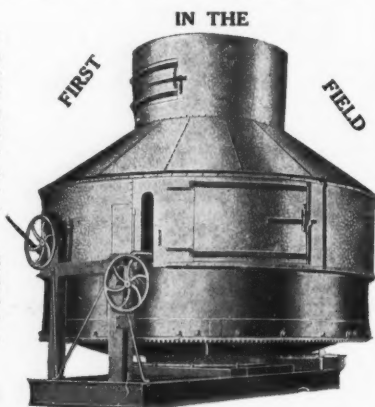
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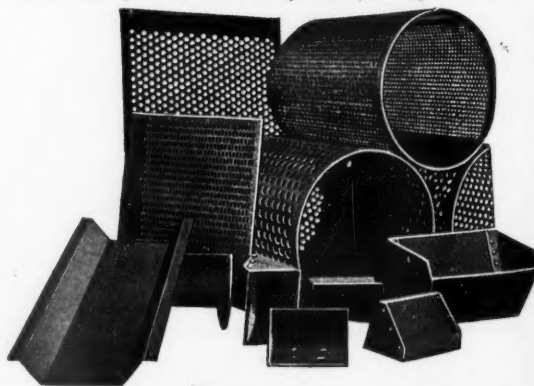
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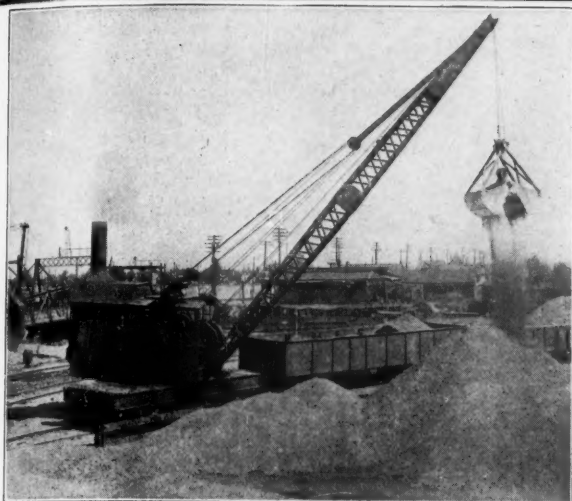
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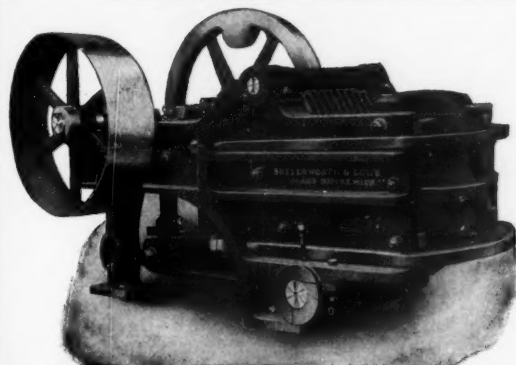
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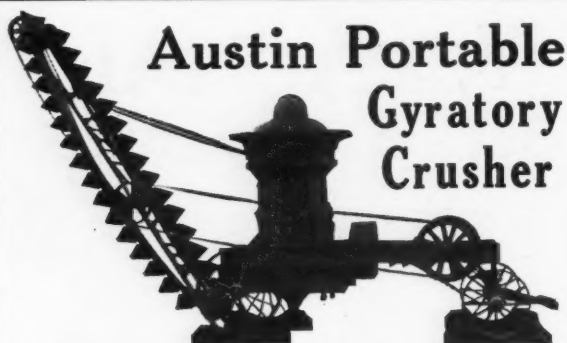
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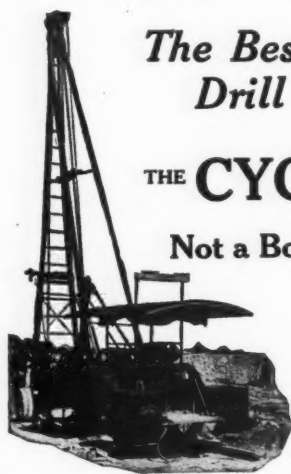
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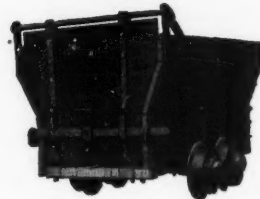
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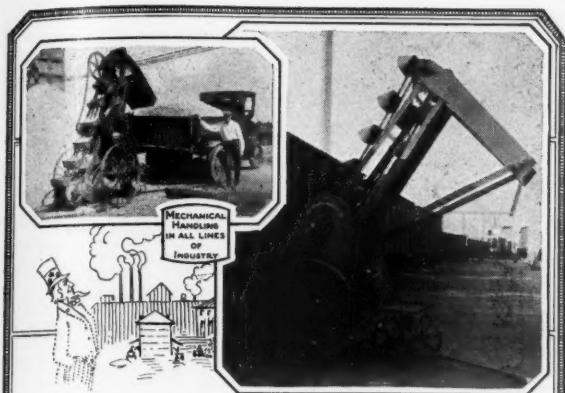
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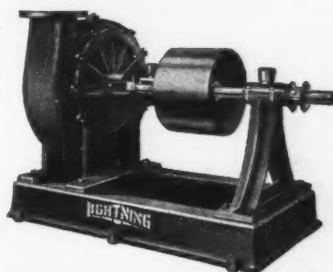
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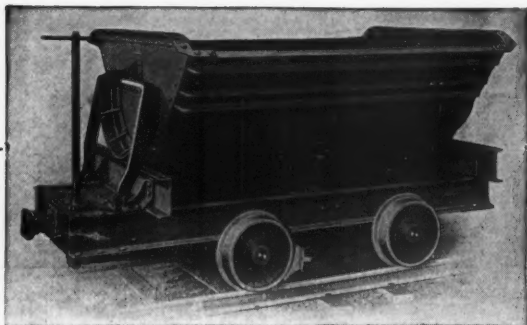


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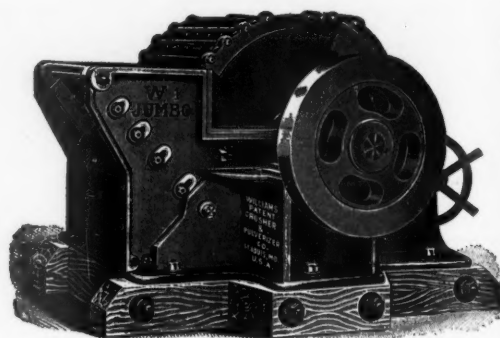


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Turns out, with four men, 16,000 to 20,000 concrete bricks in ten hours.

In severe tests, Perfect Concrete Brick have proven stronger than common clay and pressed clay brick.

The power tamper may be operated by a one horse power motor, a 2½ horse power gas engine or direct from a line shaft.

"There is no better brick machine manufactured," says W. T. Sharp, of Montana, owner of a Perfect brick plant.

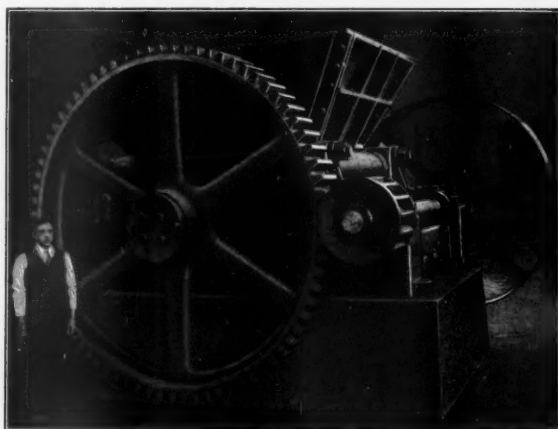
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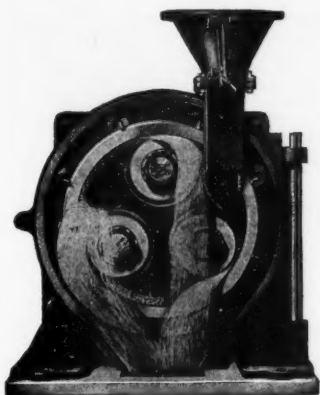
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Capacity, 5 to 500 Tons per Hour

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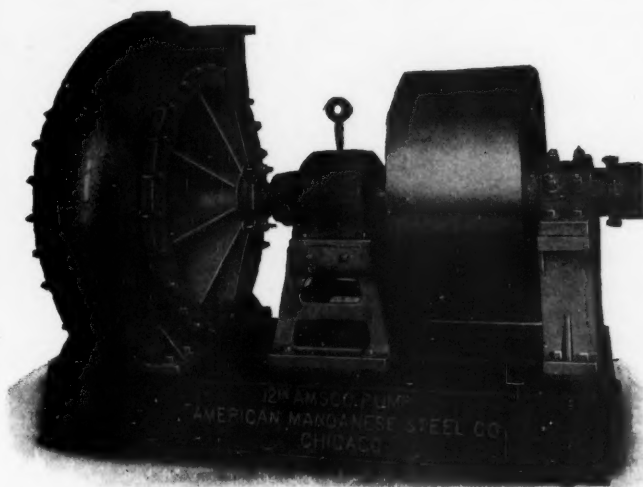
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SCHAFFER Continuous Lime Hydrators

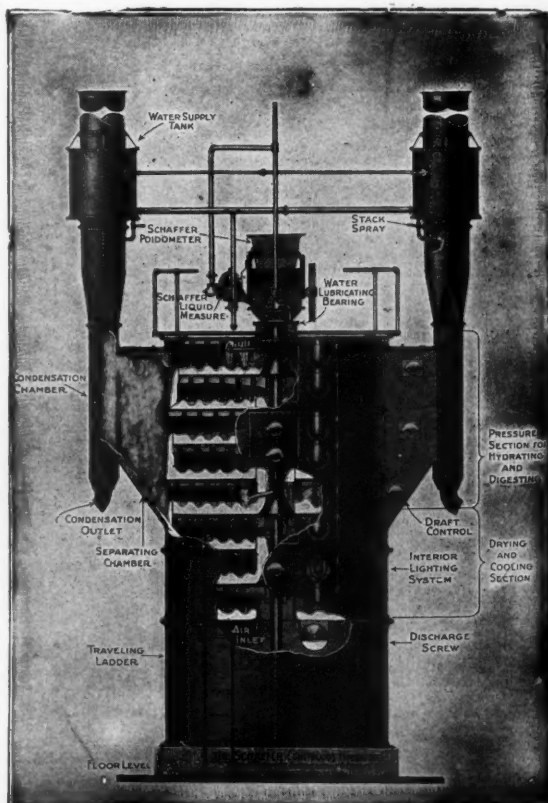
AUTOMATIC operation delivers lime by weight, not volume, to the Schaffer Hydrator. Automatically, water, too, is added in correct proportion—insuring a continuous flow of a superior product.

The flexibility of control enables the use of either high calcium or dolomite lime, while at the same time the automatic operation of Schaffer Hydrators solves the labor problem, as they require but little attention.

Our literature on the Schaffer Hydrator covers all the questions you now have in mind. Write for it at once!

Schaffer Engineering & Equipment Co.

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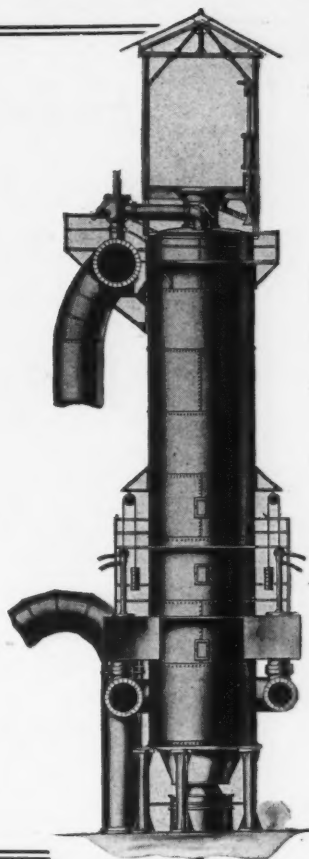
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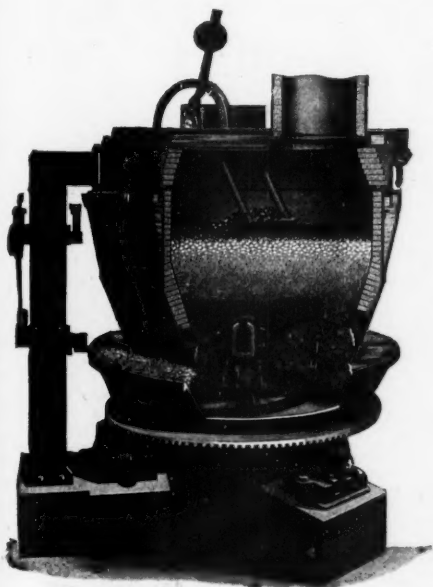
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Using the Nationally Famous Virginia Foundry Irons



The Machine of Absolute Satisfaction



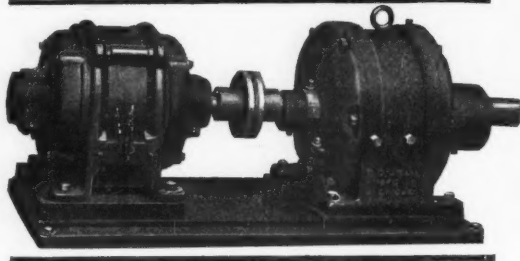
Selected by every large purchaser in the steel industry since the armistice. Three recent installations at leading Eastern Lime Plants.

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James Speed-Reducing Transmissions



**Provide
Operating
Economy**

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Any reduction of speed from the ratio of 4:1 to 1600:1 can be furnished.

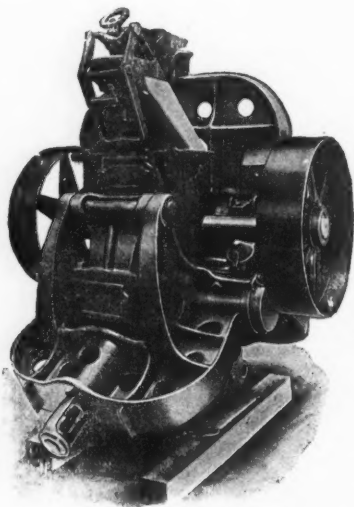
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**Preliminary Grinder
for Tube Mills**



LIMESTONE	20 to 40 Mesh
CEMENT CLINKER	20 to 60 Mesh

MAXECON MILL PERFECTECON SEPARATOR

The UNIT that has LARGER
OUTPUT with LESS POWER
WEAR and ATTENTION than
any other.

It will be to the interest of those who operate CEMENT
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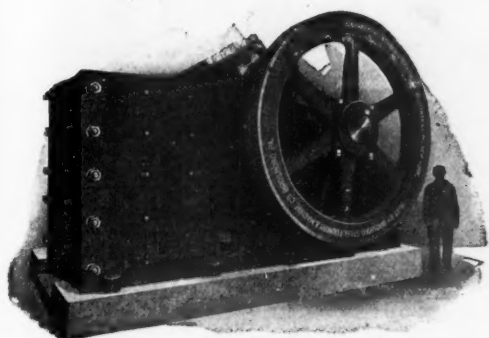
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We will be glad to tell you about it

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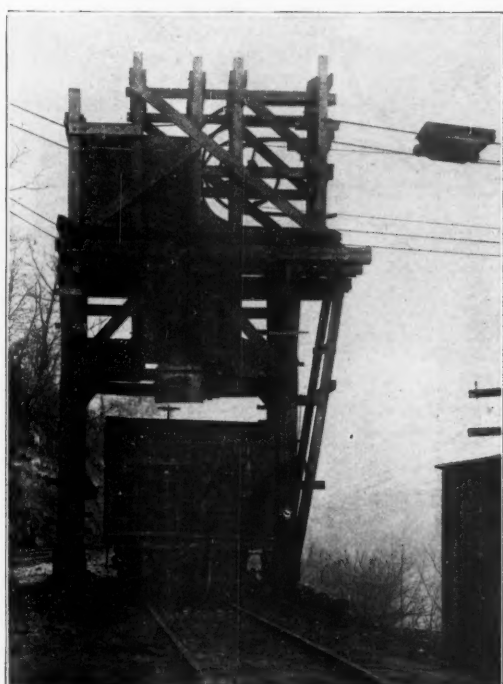
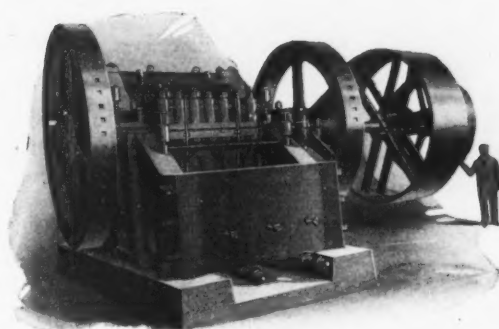
BUCHANAN CRUSHERS
ALL STEEL **JAW** PATENTED

The solid all steel construction, made entirely of the material with which other crushers are reinforced, gives the Buchanan a greater length of service and a higher crushing efficiency.

Our Bulletin No. 10 will tell you the story of these remarkable machines, and will post you on the maximum of crushing at the minimum cost.

There is a size made to suit your need.

C. G. BUCHANAN CO., Inc.
90 West Street New York



With such equipment operators of mines and quarries are moving thousands of tons daily

Break Jail! Why Be a Prisoner to High Production Costs

when the

AUTOMATIC AERIAL TRAMWAY

will serve as a means of reducing expenses and enable you to meet competition?

**More Tons Moved
Less Labor Required**

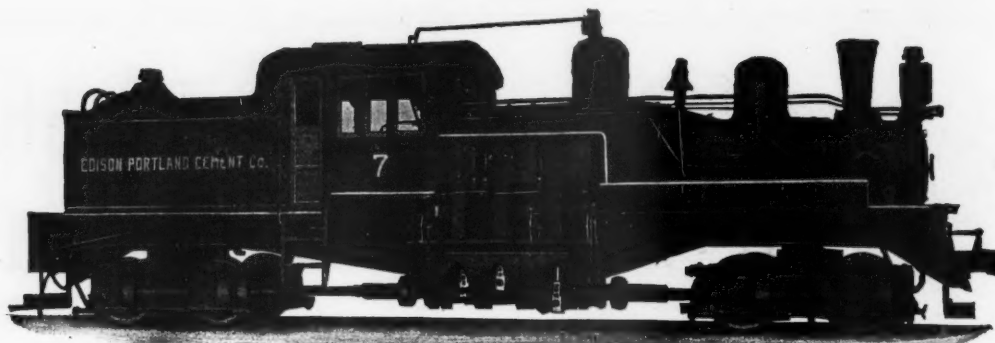
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Will Do the Work**

Let Us Solve Your Problem

Write Us for Photographs and Description

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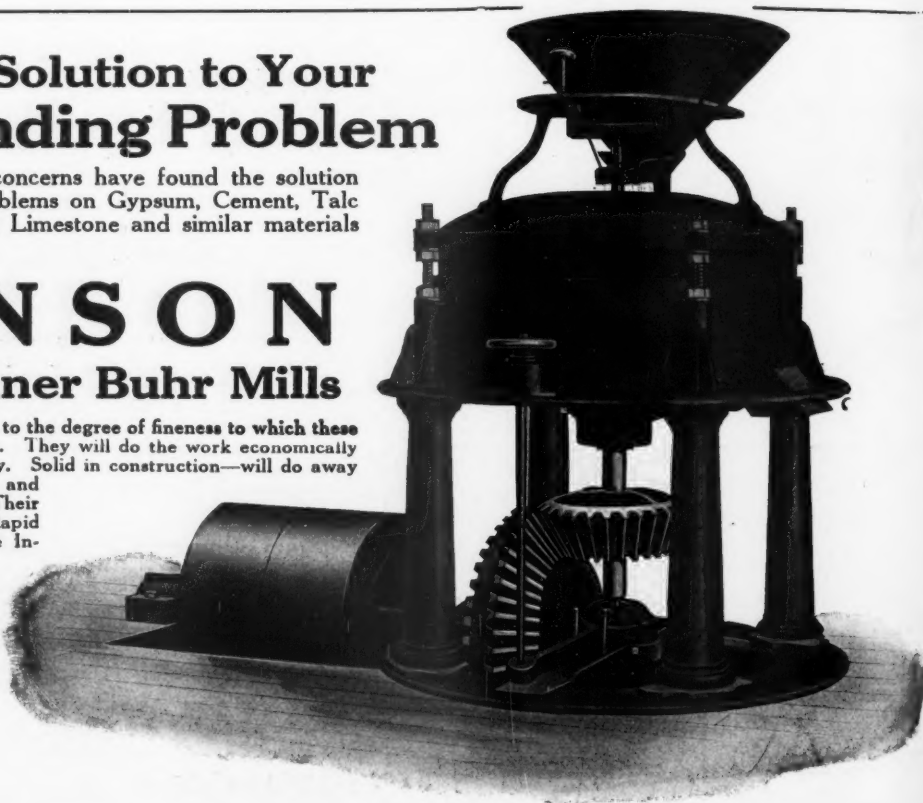
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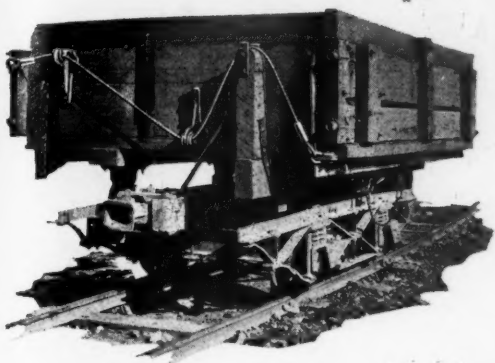
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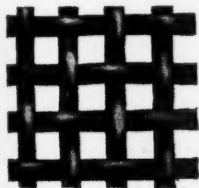
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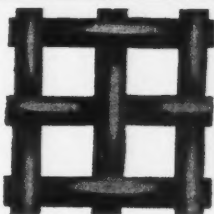
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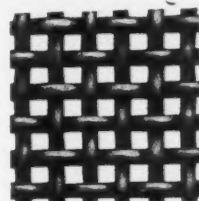
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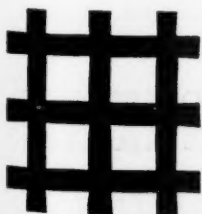
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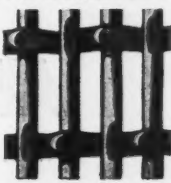
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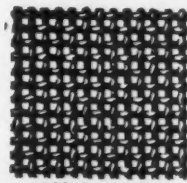
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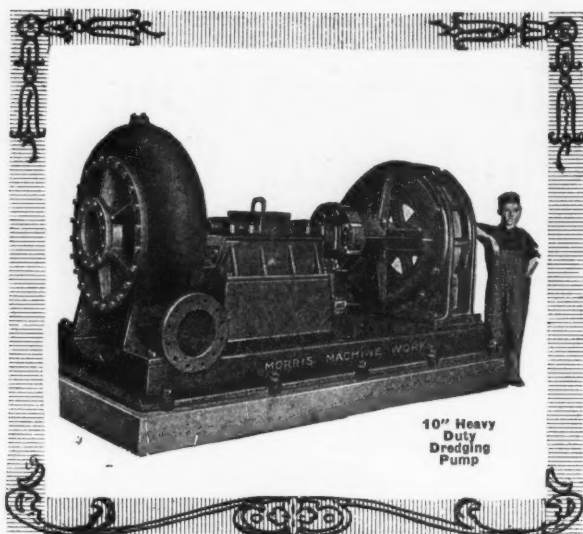


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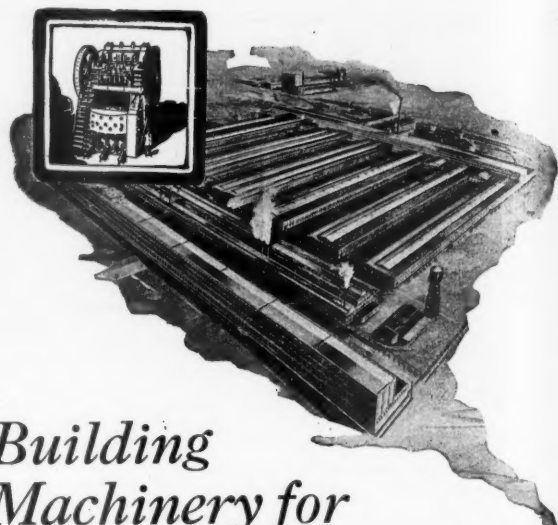
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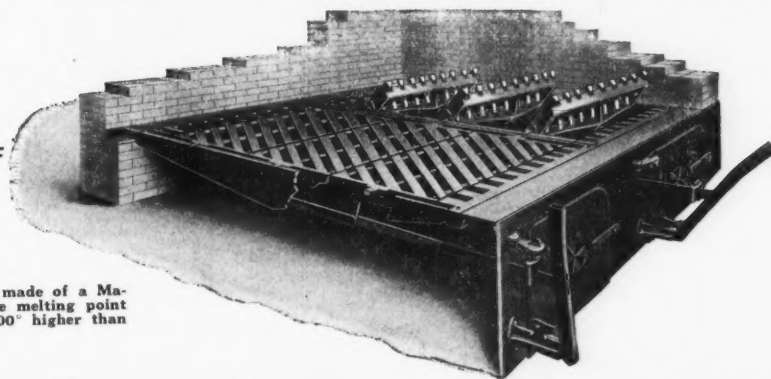
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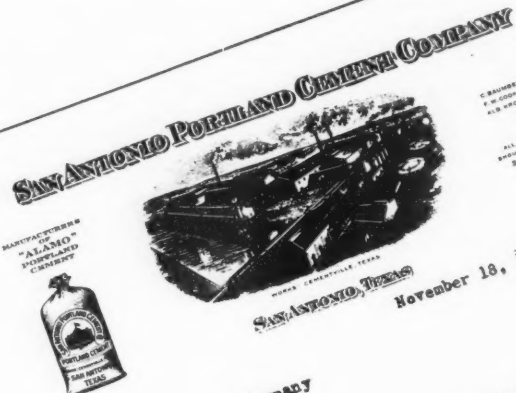
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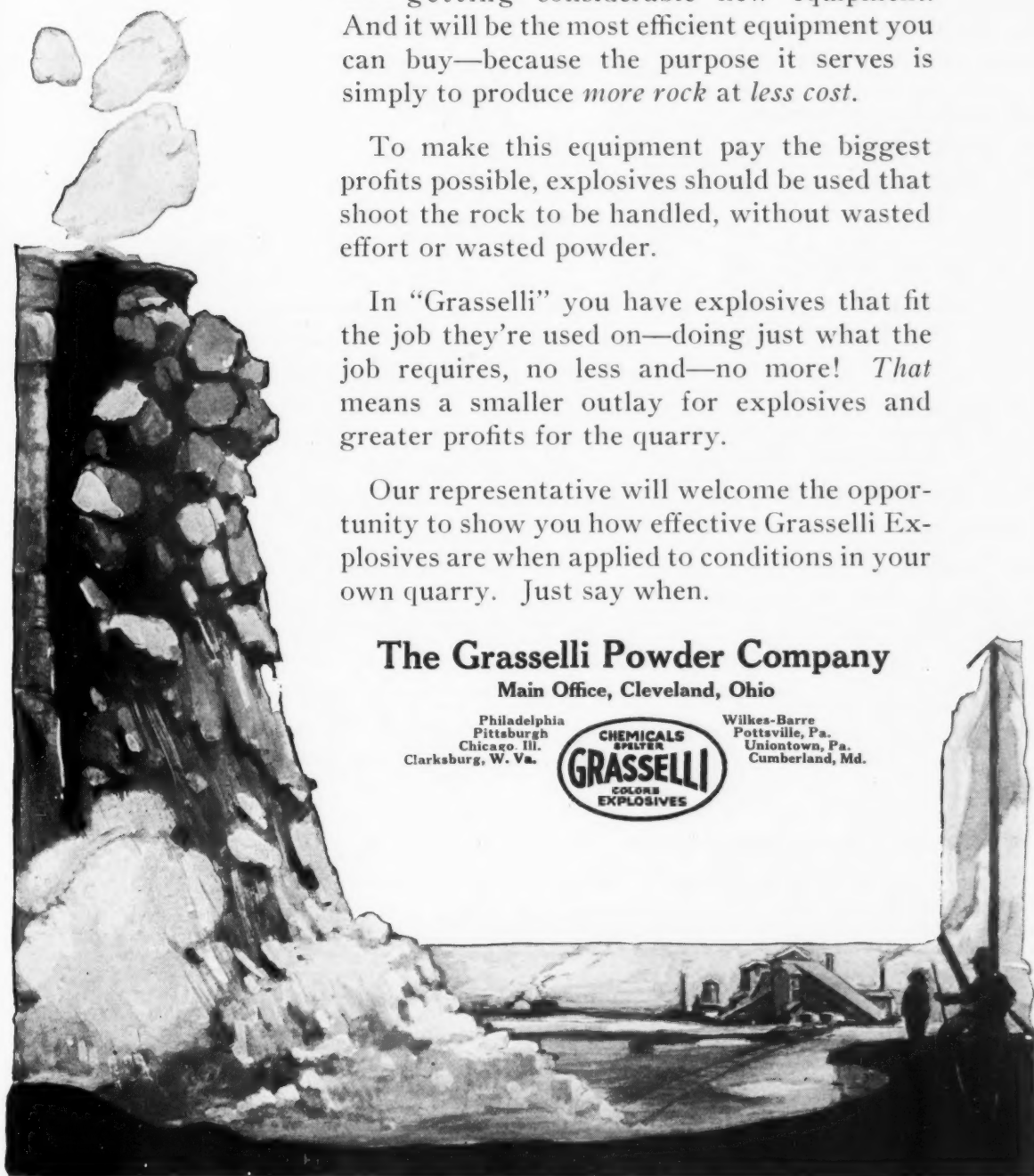
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